SEPTEMBER 1962

WOODWORKER

Needlework box in veneered chipboard and oak

Bentwood chairs

French polishing

Guitar—(continued)

Chamfering

Wood carving
—Acanthus leafage

Tool sharpening
—French spindle
cutters

Marquetry cutting
—conclusion

VOL 66 : NO 826

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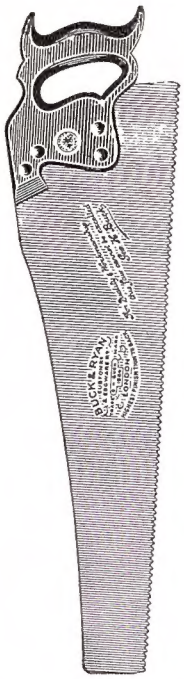

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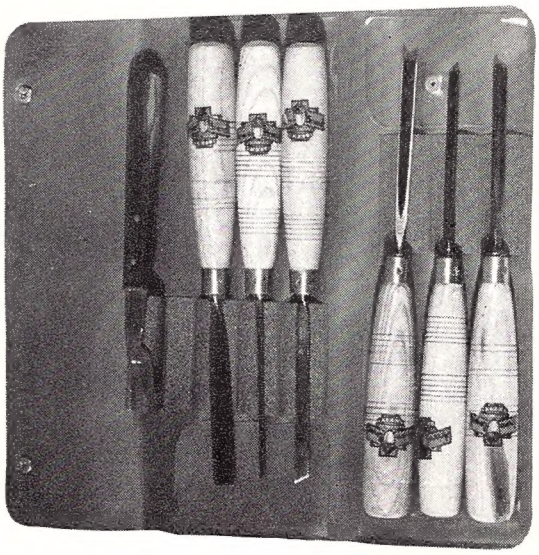

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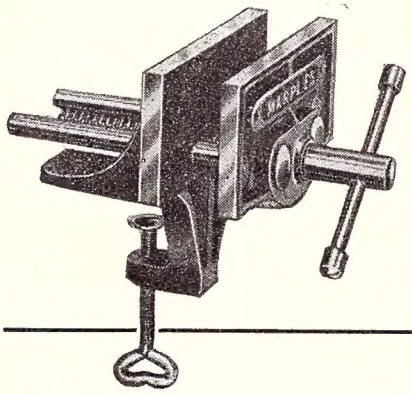

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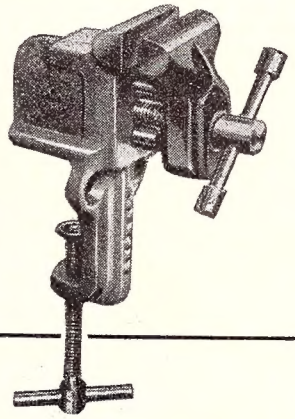

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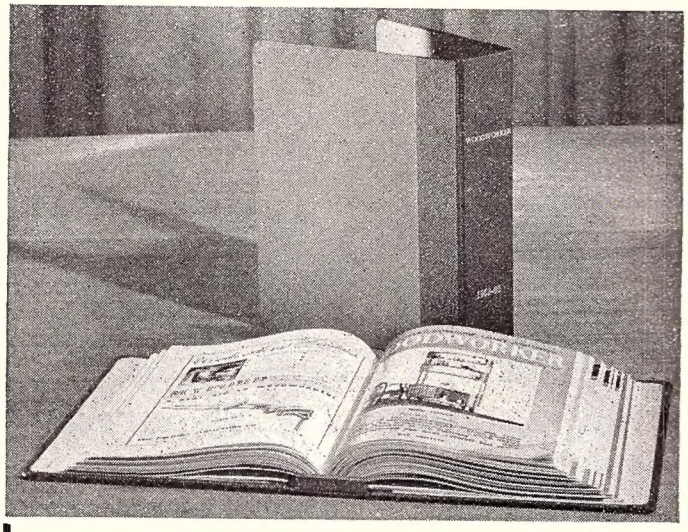

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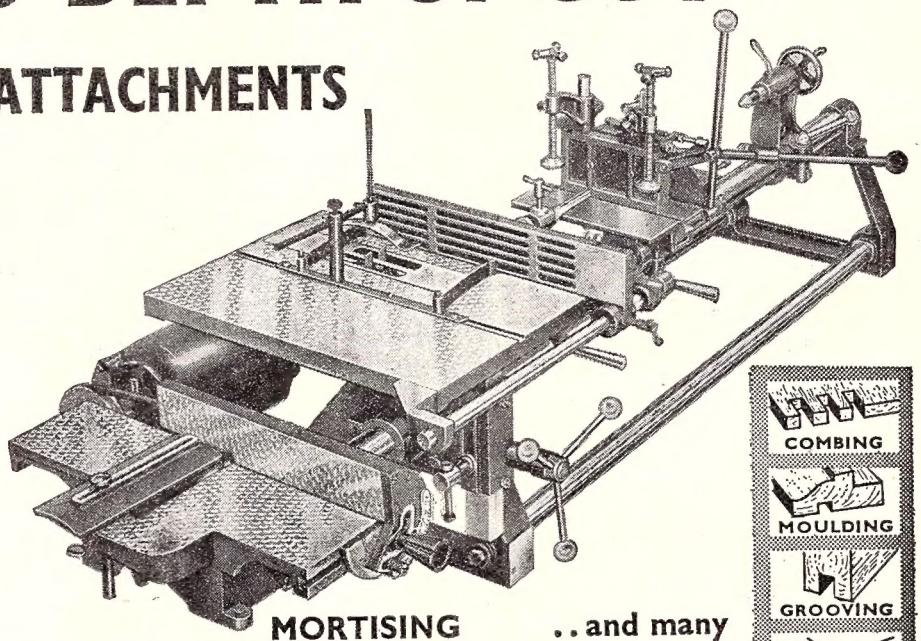

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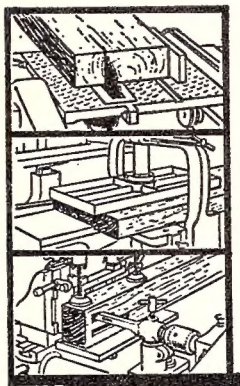

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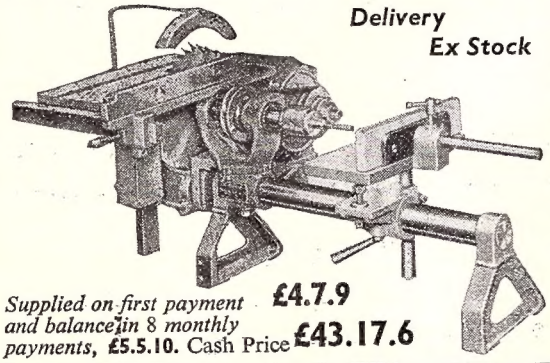

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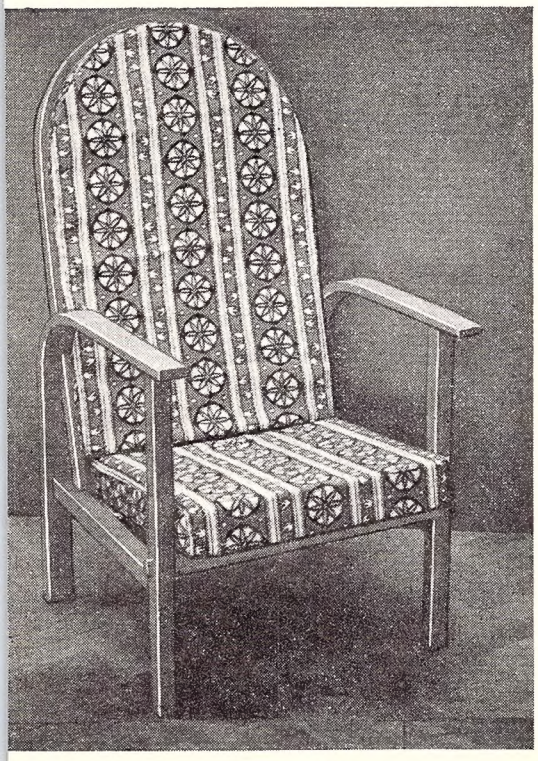
VOLUME 66 NUMBER 826

WOODWORKER

SEPTEMBER 1962



BENTWOOD FIRESIDE CHAIRS

The two fireside chairs in Figs. 1 and 2 are in oak with latex or plastic loose cushions, the arms and back being steam-bent round formers and mortised together. The varying sizes of the two should enable the reader to select whichever is the more suitable for the user. Both are simple to make (they were in fact made by pupils at a grammar school).

by R. M. SMITH, M.Coll.H., Guthlaxton Grammar School, Wigston Magna, Leicester (Head of Handicraft Department, and one-time Visiting Examiner in Craftwork for Associated Examining Board)

FIG. 1. TALL-BACK CHAIR WITH EXTRA DEPTH OF SEAT.

The whole framework is in oak finished natural colour.

CONSTRUCTION OF THE two chairs is identical. The following sizes are those of the larger chairs, but it is only a matter of altering them when the smaller one is made.

The two sides are made from three pieces of wood, the arms finishing 3 ft. 6½ in. by 2 in. by ¾ in., and bent as described later. The two side stretchers are each 1 ft. 8¼ in. by 1¼ in. by 1¼ in. Through-tenons are used to join them to the legs.

The two sides are joined by front and back rails. The front rail is 1 ft. 9½ in. by 1¼ in. by 1¼ in. and the back rail 1 ft. 9½ in. by 2 in. by ¾ in. The front rail is through-tenoned into the front legs, so that bottom edge is level with the top of the side stretcher rails.

The back rail is tenoned into the back part of the curved arm, its top is level with the underside of the side stretchers.

The back

The hoop finishes 6 ft. 8 in. by 1¼ in. by ¾ in., and is bent to shape as illustrated in Figs. 3 and 9. It is held together at the open end by a tenoned cross rail. Five dowels, each ⅝ in. diameter, are drilled into the top of this cross rail and into the curved top of the back. The back is made ½ in. wider than the shoulder-to-shoulder measurement of the front and back rails. It is then let into the inside of the arms and side stretcher rails, and finally secured by a screw into the side stretcher rails. There is no difficulty about boring the holes if a jig is first made and cramped to the wood as shown in Fig. 13.

The seat

Two pieces, each 1 ft. 8¾ in. by 1¼ in. by 1¼ in. are mortised into the front and back stretcher rails. The tenons are cut at an angle so that they fit at 90 deg. into the back and front rails. This gives the necessary slope to the seat, which is formed by ⅝ in. diameter dowels, drilled into the inside of these seat side-rails.

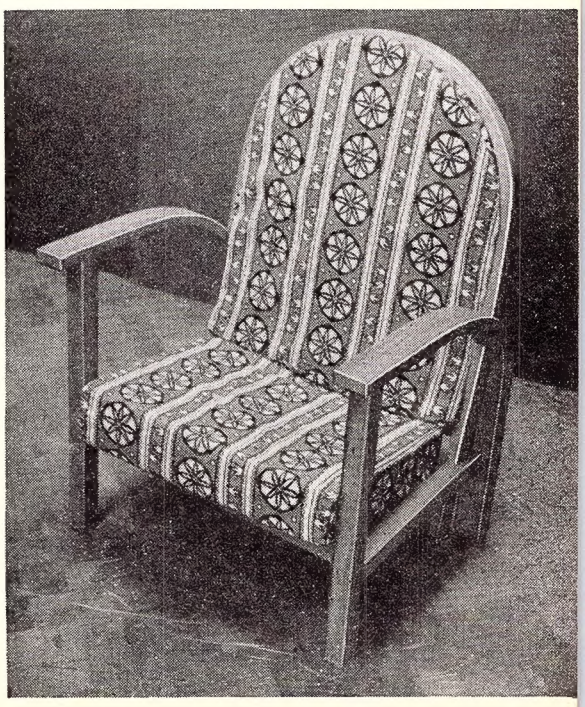


FIG. 2. CHAIR IN SLIGHTLY SMALLER SIZE TO MAKE A PAIR WITH FIG. 1.

Loose latex cushions are used.

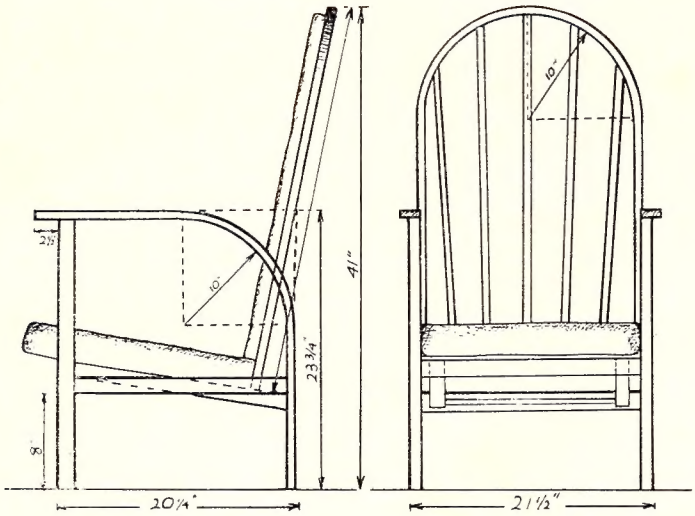


FIG. 3. SIDE AND FRONT ELEVATIONS OF LARGE CHAIR

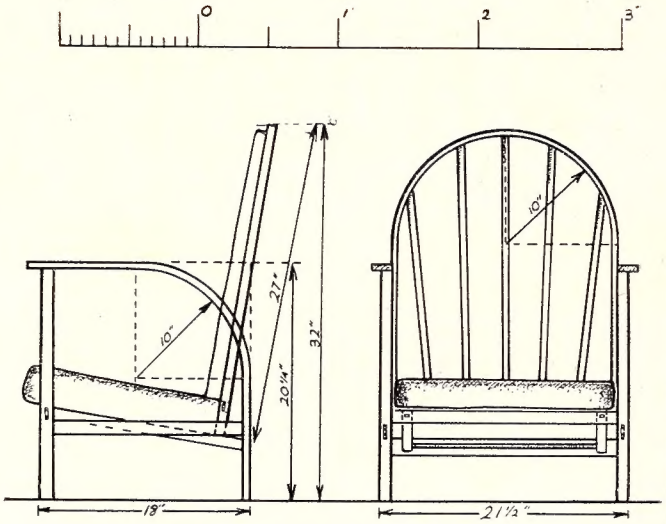


FIG. 4. ELEVATIONS OF SMALL CHAIR

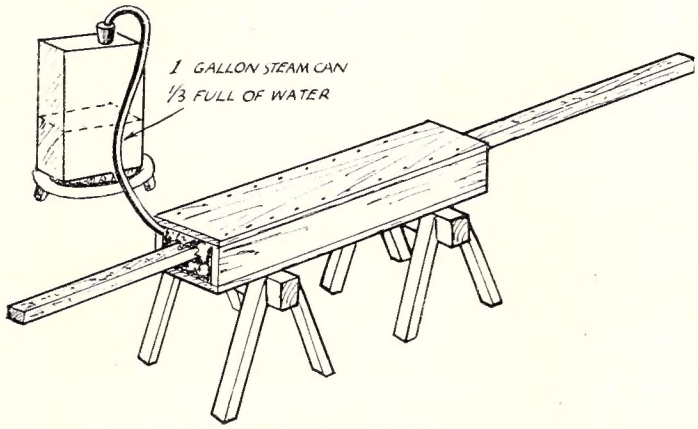


FIG. 5. HOME-MADE STEAM CHEST

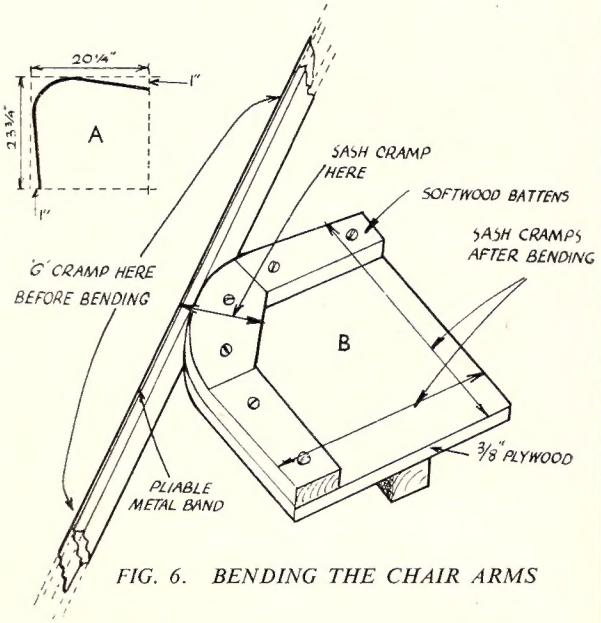


FIG. 6. BENDING THE CHAIR ARMS

FIG. 7 (below). HOW BACK HOOPS ARE BENT

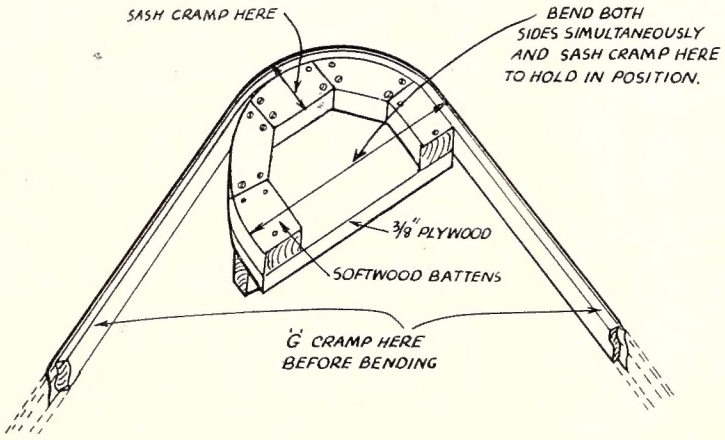
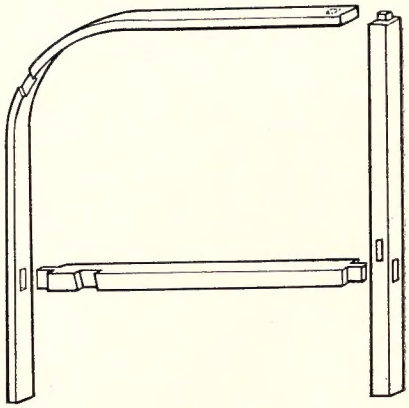


FIG. 8 (below). EXPLODED VIEW OF ARMS



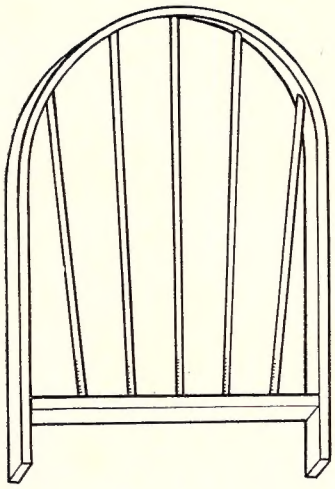


FIG. 9 (left). BACK SHOWING BENT HOOP AND RAIL TENONED IN

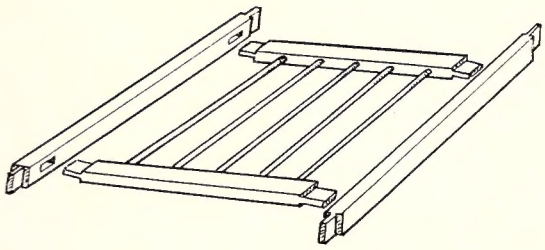


FIG. 10 (right). EXPLODED VIEW OF SEAT. IT IS ADVISABLE TO USE SIX DOWELS AS IT MAKES A STRONGER AND MORE COMFORTABLE SEAT

Cushions

These are cut in latex or plastic foam to the required size. The back cushion is $1\frac{1}{2}$ in. thick, with a semi-circular top; the seat cushion overlaps the front rail and is 3 in. thick. These cushions can be suitably covered to taste. The dowels are not uncomfortable when sitting in this chair with these types of cushions, and they form an easily-made yet strong base for the seat.

Bending the back

It is unnecessary to steam the entire length of the back as only the 36 in. long middle portion is required to be steamed and bent. Therefore, a steam chest open at both ends is used. The wood for the back is placed into the chest with only the middle portion in the steam box. The steam from the steam-can is passed into the chest, both ends of the steam chest being blocked with damp newspaper after the wood has been placed in the required position. The apparatus is shown in Fig. 5.

Bending the arms

These are bent from straight-grained oak, each piece being 4 ft. $6\frac{1}{2}$ in. by 2 in. by $\frac{3}{4}$ in. A former is made to the shape required, from $\frac{3}{8}$ in. plywood, and is thicknessed with pieces screwed on as in Fig. 6. A $1\frac{1}{4}$ in. by $1\frac{1}{4}$ in. batten is screwed to the underside for fixing into the bench vice. To counteract any springing of the arm after bending, the two sides of the former are taken in by 1 in., as at (A), Fig. 6.

The wood is taken quickly from the steam chest, a metal strap cramped into position with G-cramps and the wood pulled into position round the appropriate former. Sash cramps are applied as shown in Fig. 11. The mortises are then worked.

Cutting List

	Long *ft.*	*in.*	*Wide* *in.*	*Thick* *in.*
Large Chair				
2 Legs	2	0	—	$1\frac{1}{4}$ sq.
2 Arms	4	6	$2\frac{1}{4}$	$\frac{3}{4}$
2 Side rails	1	$8\frac{1}{2}$	—	$1\frac{1}{4}$ sq.
1 Front rail	1	10	—	$1\frac{1}{4}$ sq.
1 Back rail	1	10	$2\frac{1}{4}$	$\frac{3}{4}$
2 Stretchers	1	9	—	$1\frac{1}{4}$ sq.
6 Dowels	1	4	—	$\frac{5}{8}$ sq.
1 Back hoop	6	10	$1\frac{1}{2}$	$\frac{3}{4}$
1 Back rail	1	$8\frac{1}{2}$	—	$1\frac{1}{4}$ sq.
1 Dowel	2	$6\frac{1}{2}$	—	$\frac{5}{8}$
2 Dowels	2	6	—	$\frac{5}{8}$
2 Dowels	2	3	—	$\frac{5}{8}$
Small Chair				
2 Legs	1	$8\frac{1}{2}$	—	$1\frac{1}{4}$ sq.
2 Arms	3	4	$2\frac{1}{4}$	$\frac{3}{4}$
2 Side rails	1	$6\frac{1}{2}$	—	$1\frac{1}{4}$ sq.
1 Front rail	1	10	—	$1\frac{1}{4}$ sq.
1 Back rail	1	10	$2\frac{1}{4}$	$\frac{3}{4}$
2 Stretchers	1	7	—	$1\frac{1}{4}$ sq.
6 Dowels	1	4	—	$\frac{5}{8}$
1 Back hoop	5	7	$1\frac{1}{2}$	$\frac{3}{4}$
1 Rail	1	$8\frac{1}{2}$	—	$1\frac{1}{4}$ sq.
1 Dowel	2	0	—	$\frac{5}{8}$
2 Dowels	1	11	—	$\frac{5}{8}$
2 Dowels	1	8	—	$\frac{5}{8}$

Working allowance has been made in lengths and widths. Thicknesses are net.

FIG. 11. ARMS BENT AND CRAMPED TO FORMER

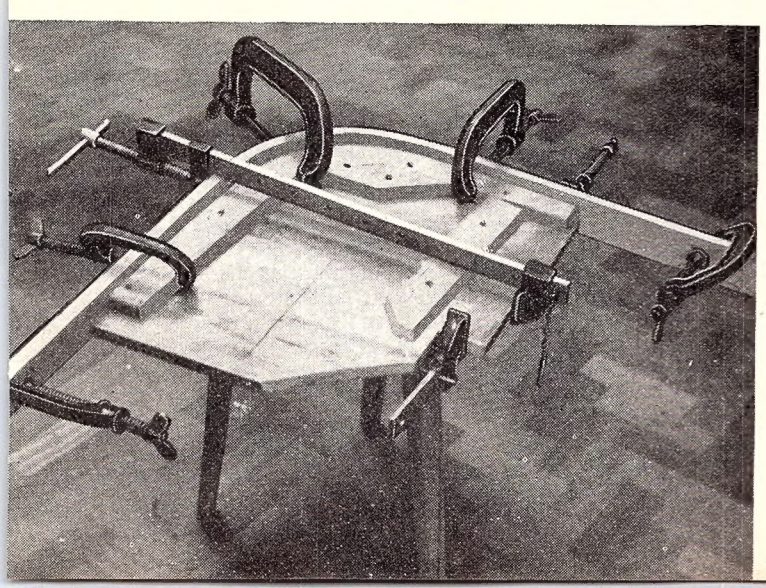
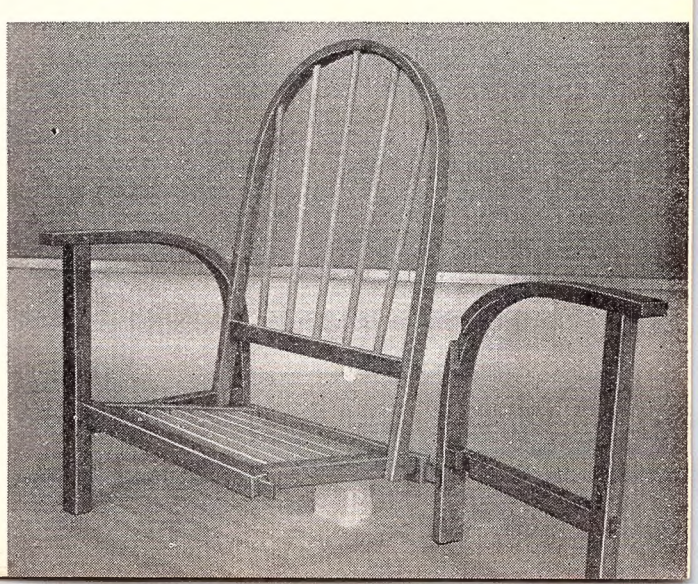


FIG. 12. PARTS OF CHAIR SEPARATED



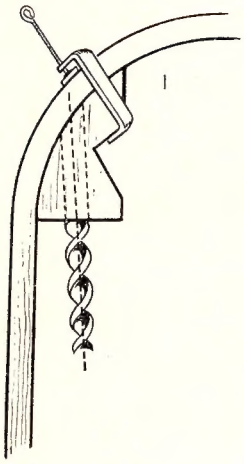


FIG. 13. JIG FOR DOWELLING

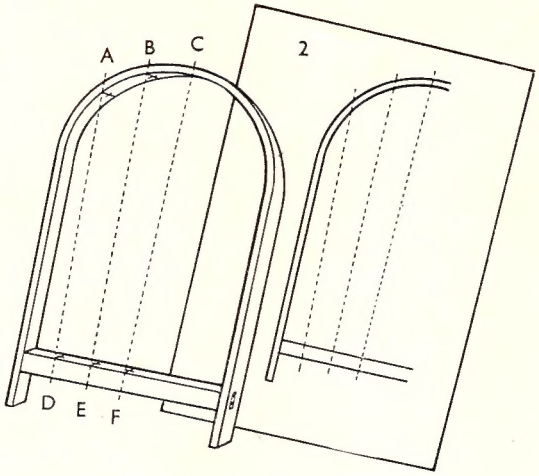


FIG. 14. MARKING DOWEL POINTS FROM DRAWING

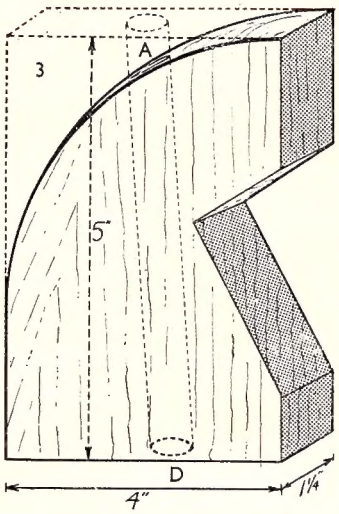


FIG. 15. DETAIL OF DOWELLING JIG

Assembling

Clean up and polish the two bent arms, side stretcher rails, and front legs with one coat of 50 per cent plastic polish and glue up. Assemble the seat, gluing the seat side rails into the front and back rails, with the dowels in position. This will be done, of course, after polishing.

Clean up the back, polish it and glue it up, cleaning up the through-tenons after the glue has set. Join the sides to the seat, place back in position, and mark the ¼ in. halvings on the inside of the arms and side stretcher rails. Take apart and work the halvings.

Finally, glue the front and back rails of the seat frame into the side frames of the chair. When the glue has set, clean up the through-tenons which will be even more decorative and certainly stronger if wedged. Slide the back through the halvings in the chair arm and side rails, lastly fixing it into the exact position by screwing the bottom of the back frame into the side stretchers from the inside of the chair frame.

Measure a suitable length for the front arm to protrude in front of the front legs, saw off and round or chamfer as desired. Flourpaper the whole chair and give one coat of 100 per cent "Gleem" plastic polish. Place the upholstered cushions in position, and the chair is ready for use.

(422-480)

A BROADENED SCOPE

WE HAVE REALIZED for some time that the present size of the WOODWORKER is inadequate to cover the many requirements of readers who include both highly skilled craftsmen and beginners, and the whole range of men whose ability lies between these two extremes. We are therefore increasing the size of the magazine, beginning with the October number, so that we shall be better able to help all whose interest is in woodwork. One point we should like to impress on readers is that our policy in integrity of construction, good design, and high standard of illustration will be maintained. The only change is that the scope is broadened.

To give readers an idea of the enlarged magazine, the following are some of the new features in the October number:

The Right Tools for the Job. A four-page supplement which lists the various woodworking operations—rebating, recessing, grooving, etc., and gives the machines and hand tools that can be used.

Frame Making. By a trade framer who tells the methods used in the trade in framing pictures of all kinds.

The Beginner in Woodwork. A new series written by a well-known teacher in a Training College who knows from experience the difficulties of the beginner.

Woodworker's Dictionary. An illustrated list of terms used in woodwork with full explanations. A series to last over many months.

Joinery and Carpentry. A range of articles which will deal with all branches of the subject.

In addition the present series on wood carving, tool sharpening, and polishing, will be continued; and there is a wide range of designs for things to make, including a Couronne table, easy chair and stool, cot-divan, coffee table, and the bench and its equipment.

To meet the cost of the enlarged size it will be necessary to raise the price to 1s. 6d., but we are confident that readers will find the larger magazine well worth the increase. As it is inevitable that there will be a wide demand for this October number we advise all readers to place a definite order for it with their newsagent, as otherwise it is impossible to gauge the requirements of all districts.

How to Make Built-in Furniture, by Mario Dal Fabbro. The author of this book has published a number of books on woodwork in U.S.A. The present book is a series of suggestions for fitments of all kinds for the various rooms in the house, and should be useful to the man seeking general ideas. Some of the recommended methods of construction are not good practice, but there are certainly plenty of ideas. It is illustrated throughout with line diagrams, and cutting lists are provided. Published at 30s. net by John Murray (Publishers) Ltd., 50 Albemarle Street, London, W.1.

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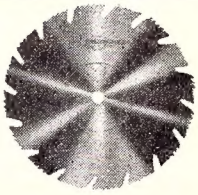

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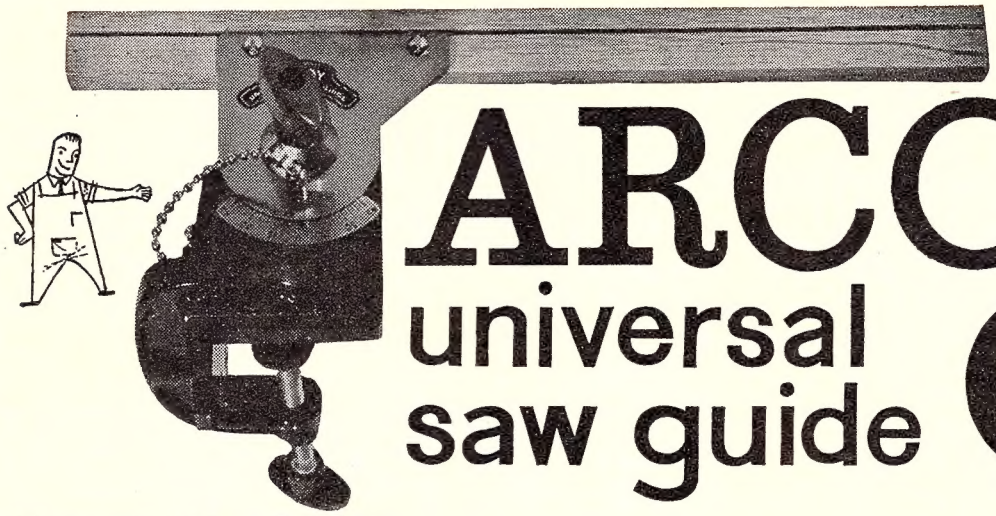

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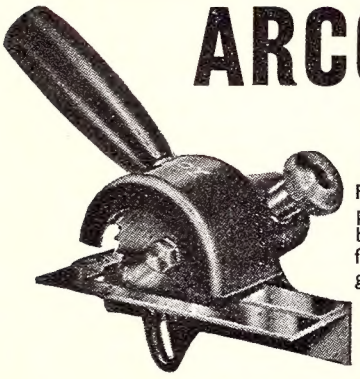

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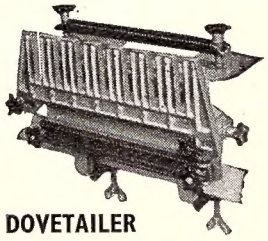

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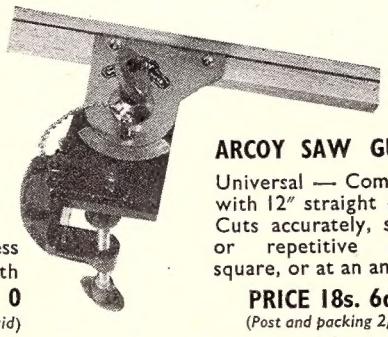

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THE CHARMED CIRCLE

DURING THE EARLY summer months my garden became a battleground. For at least the past 20 years blackbirds had nested in the thorn hedge, but this year a pair of thrushes coveted the spot, and the battle was on. My sympathies, I may say, were entirely with the blackbirds who had probably been born in that hedge and were a friendly, trusting and beautiful young couple. Young Bossy, the male, was a fine, imperious fellow, his orange beak and the orange orbits of his eyes vivid flashes of colour against the glossy black of his plumage. Mabel, as we called his young bride, a sleek, lovely creature, would follow one round the border as tame as any robin. Meet her unexpectedly and she would show no fear but simply stop short with a polite "after you" inclination of the head. It always made me feel I had been waved on by a duchess.

They were building their first nest when calamity came. There were fights, skirmishes, every kind of hostile manoeuvrings as day after day Bossy fought to defend his home and territory. He became more and more battered in the process and in the end the enemy's persistence wore him down.

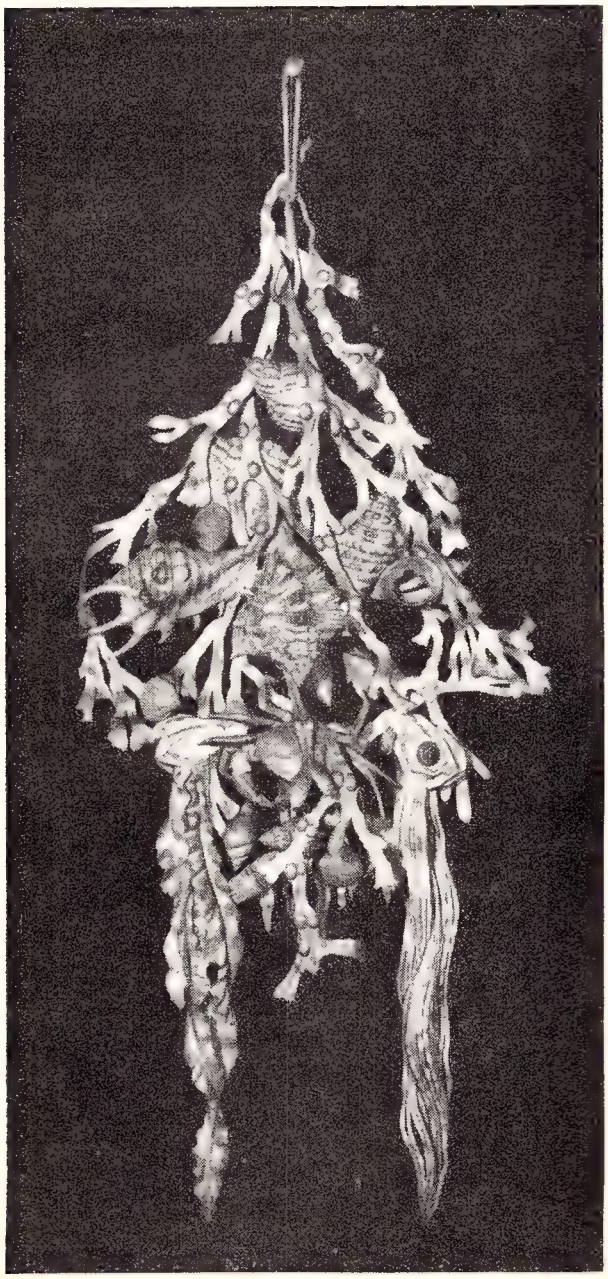
But not without a final flash of his old spirit. After a particularly savage fight, he was sitting on top of the fence by the thorn hedge, a bundle of sheer exhaustion, barely able to utter an occasional croak of defiance, when the female thrush sidled up to him with an unmistakable air of "You've had it chum".

The weary head turned like lightning and he gave her a vicious peck. With a shriek of rage the lady flew down into the flower border and let out a shrill stream of all the bad language she knew. Making a prodigious effort, Bossy stood up, flicked his tail with a faint return of his old, imperious manner and croaked out a few bars of song, repeating them several times in hoarse but manifest glee, before subsiding once more into his misery. But that had done him a power of good.

Nevertheless, the happy days were over. Neither side won decisively. Nests were begun and abandoned as the fortunes of war swayed. In the end the thorn hedge became deserted and the garden a kind of "no man's land" into which neither party could enter without provoking a hostile reaction.

It seems that even creatures with wings must have their one small plot of earth, regardless of their hardier brethren who go winging their ways over the wide spaces of the world when the call comes to them. It makes up their pattern of life and they will fight to preserve it as men fight, wanting the known thing, the familiar thing, leaving the wide spaces of earth and air to those others. It is the

(*Continued on page* 199)



DESIGN AND CRAFTSMANSHIP

Consequent on our illustration in May of a carved acanthus scroll mirror frame now in the Victoria and Albert Museum, we have received the following letter from Mr. E. H. Pinto, whose collection of wooden Bygones is so widely known:

"You rightly posed the difficulty of designing and drawing such a three dimensional piece before it ever existed, except in the artist's imagination. You also drew attention to the difficulty of carving leafwork, when it rests on nothing.

The enclosed photograph shows a mid-nineteenth-century carving which must have posed these same questions to an even more acute degree. The whole of this carving, which at its greatest dimensions measures 2 ft. 7 in. long by 1 ft. wide and 3 in. in depth, is cut from a single block of pearwood. The subject is marine life, treated in a most imaginative and realistic manner. The main structure or web is designed as an asymmetric swag of algae, or various seaweeds of ribbon-like texture, in many places completely detached from the background. Some of the carving is so thin that a draught will make it waver. Encrusted in the weed is a perfectly modelled crab and a wide variety of sea-shells, all executed with remarkable vigour and fidelity. The whole swag is suspended from a hook on a cord, looped round a nail. The nail, the cord and the hook are all carved from the same block of pearwood as the rest of this masterpiece.

A label on the back of the frame states that the carving was 'By Hollingsworth of Grimsby, a builder, he died young. Bought by Mr. Ellison of Sudbrooke Holme in 1858 for the sum of Thirty Pounds.'

William Hollingsworth, a pupil of Thomas Ward of Hull, must have been a remarkably gifted artist designer and as superb a craftsman as his contemporary, Thomas Wallis of Louth, who was also a pupil of Ward. It is difficult to imagine how Hollingsworth either set out or held this amazing composition, whilst carving its delicate intricacies. When it came to me, the glass was missing and the carving was badly damaged: it had twenty-two breaks in it. It required all my patience and improvisation even to devise means of carrying out the repairs."

FIG. 1. VIEW OF FINISHED NEEDLEWORK BOX

NEEDLEWORK BOX IN OAK

by J. R. HASTE

This workbox of appealing design provides spacious drawers and interior fitments which should prove adequate for the needlework requirements of the average family. It can be made in any two contrasting hardwoods. This one is made with oak front, back, legs, etc. The sides and top are of dark stained veneered chipboard.

THE WORKBOX IS made in two units, the legs and the carcase being separate and screwed together at the finish. The carcase, although of box form, is slightly unusual in construction in that the back and front are housed into the two ends (Fig. 5). The bottom is of solid timber and is joined to the two ends by means of lap dovetails.

In the original workbox the two ends were made from $\frac{3}{4}$ in. chipboard, veneered on both sides. The edges were lipped with oak, the edging strips being mitred at the corners. The advantage of this method is that no grain is left showing on the top edge, and also the chipboard will not warp.

It was found that the joints could be cut quite satisfactorily in the chipboard, the only precaution taken was to leave the pins of the dovetail larger than usual.

The carcase

The two ends are first planed up to 13 in. by 12 in., and the housing joints for the front and back pieces and the interior bottom are set out, stopping them as shown in Fig. 5. As this has to be done as accurately as possible, it will be found helpful if a centre line is drawn on the two ends and all the setting out measured from these lines. The shape of the sides can be marked out, but no cutting is done at this stage to protect the edges from bruising.

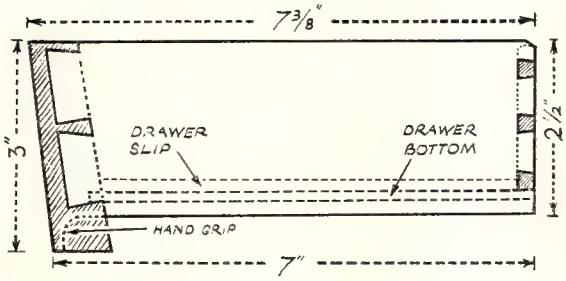
The front, back and bottom are next cut to length. The distance between the two ends is $19\frac{1}{2}$ in., $\frac{3}{8}$ in. being allowed for the depth of each housing so that the back and front are cut to $20\frac{1}{4}$ in. length; $\frac{1}{2}$ in. is allowed for each dovetail so that the bottom is cut to $20\frac{1}{2}$ in. The edges can be trimmed on a shooting board.

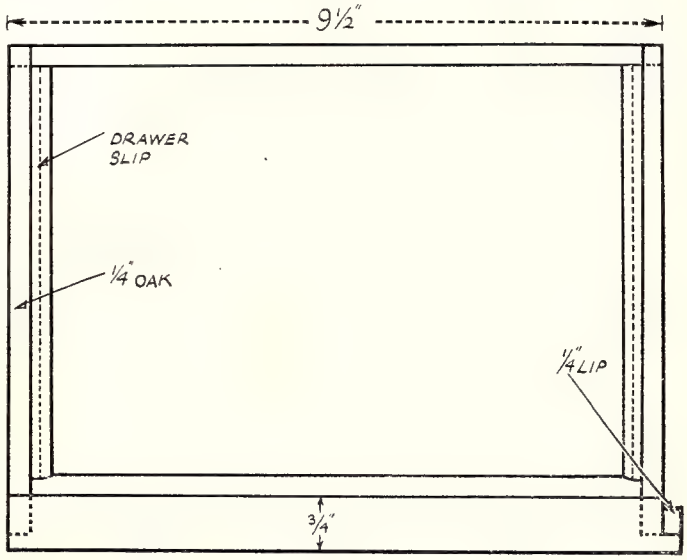
The three pieces can now be planed to width; the edges, however, are not square but bevelled as shown in the sectional drawing, Fig. 4, the bevel being marked on the wood by means of a sliding bevel. The $\frac{1}{4}$ in. grooves for the interior bottom and the rebate on the back piece for the bottom are now cut by means of a plough and a rebate plane. The dovetail joints between the bottom and the ends can now be cut and the housings cut to a depth of $\frac{3}{8}$ in., the bottom of the housing being cleaned with a router.

The front and back could, if wished, be made from $\frac{1}{2}$ in. ply, and the edges lipped with oak. In this case drawer slips could be used instead of a groove to accommodate the interior bottom. The ends should now be shaped and the $\frac{1}{4}$ in. lippings glued and pinned on, the small holes being filled in before polishing. When dry the edges should be rounded.

The drawer dividing piece (Fig. 3) can be made at this stage and the tenons cut in the bottom and the interior

FIG. 2 (below). END ELEVATION OF DRAWER AND (right) PLAN





bottom. The mortises are taken through in the bottom but only to a depth of ⅜ in. in the interior bottom. A small wedge-shaped piece is cut out of the front edge of the bottom piece on account of the edges of the bottom being bevelled. Because of this the marking out of the mortises should be done before the edges are bevelled. The guide piece is tenoned into this front piece and is fixed to the bottom by slot screwing so that the bottom is free to move.

The front can now be veneered. The two matched veneers are shot between two pieces of timber to obtain two straight edges and a perfect joint. The joint is then taped. The strip for the drawers is cut off using a straight-edge and a sharp knife. The front is keyed with a toothing plane, sized and veneered using a veneering hammer.

The carcase is now ready for gluing up. The front, back and interior bottom are first glued into the ends, and finally the drawer dividing piece and the bottom.

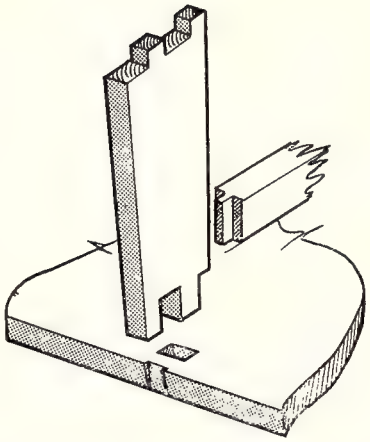


FIG. 3. DRAWER DIVIDING PIECE

The leg assembly

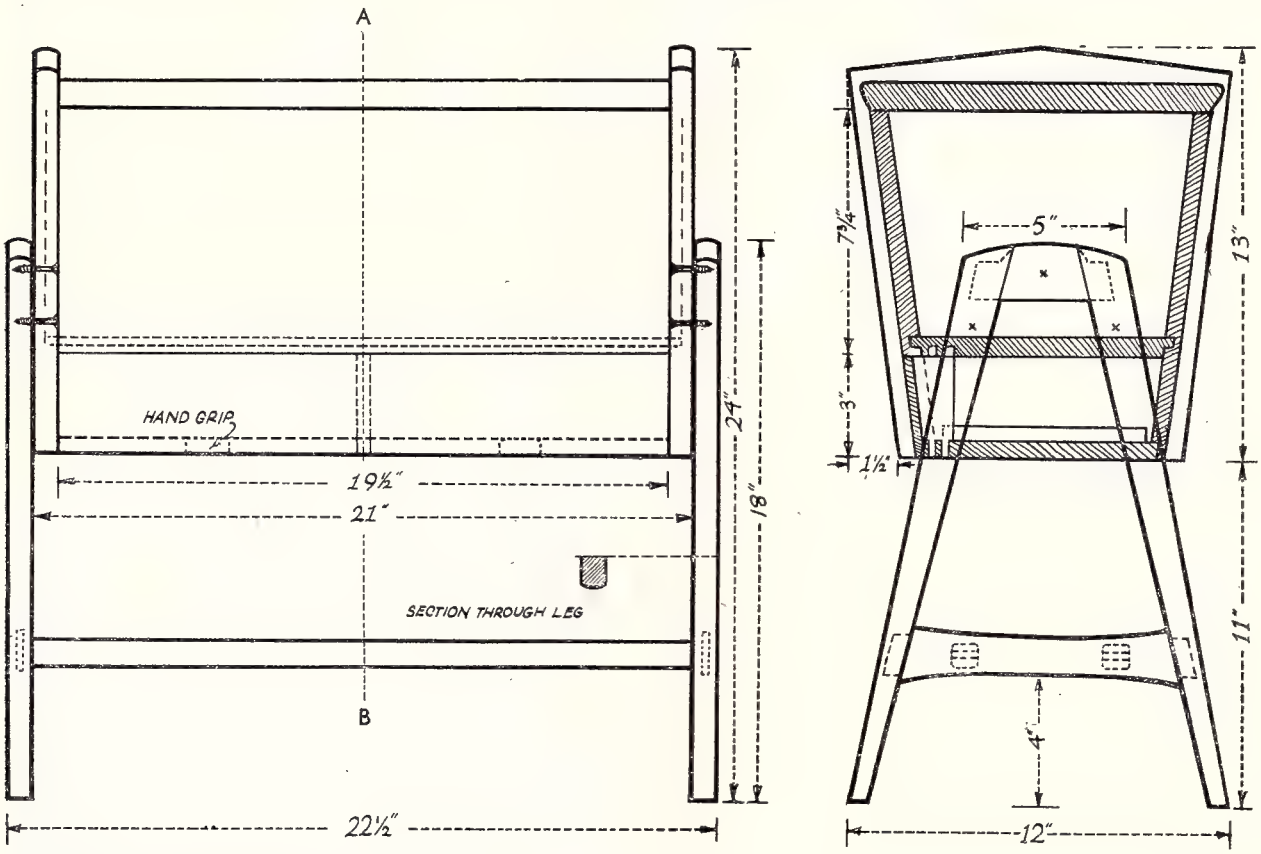
Mortise and tenon joints are employed throughout the leg assembly (Fig. 5). The end frame of the assembly should first be marked out on a piece of plywood so that the angles for the tenon shoulders can be obtained. All the joints are cut before any shaping is done. The two end frames are glued up first and when dry the round can be worked on the legs. The two cross rails are then glued and pinned from the underneath. It should be noted that the two end rails as well as being shaped are slightly rounded on the top and bottom. The two tie rails are also rounded on the top and bottom. The legs are fixed to the carcase by three 1¼ in. 8 brass screws through each end from the inside.

The drawers

The drawers differ from the usual drawer construction in that the dovetails are not at right-angles but follow the slope of the front. The dovetails are therefore set out as shown in the drawing (Fig. 2). Another difference is that the drawers run right through, covering the front edge of the bottom, and therefore the drawer fronts are wider than the sides by ½ in. Each drawer also has a ¼ in. lip down its centre edge to cover the dividing piece.

Handles are not used on the drawers; but hand grips are cut in the front of the drawers out of view (Fig. 2). The rest of the drawer is of usual construction with through dovetails at the back. Drawer slips are made to accommodate the ⅛ in. plywood bottoms. After the

FIG. 4 (left). FRONT ELEVATION (right) SECTIONAL END ELEVATION ON A—B WITH LEGS SUPERIMPOSED



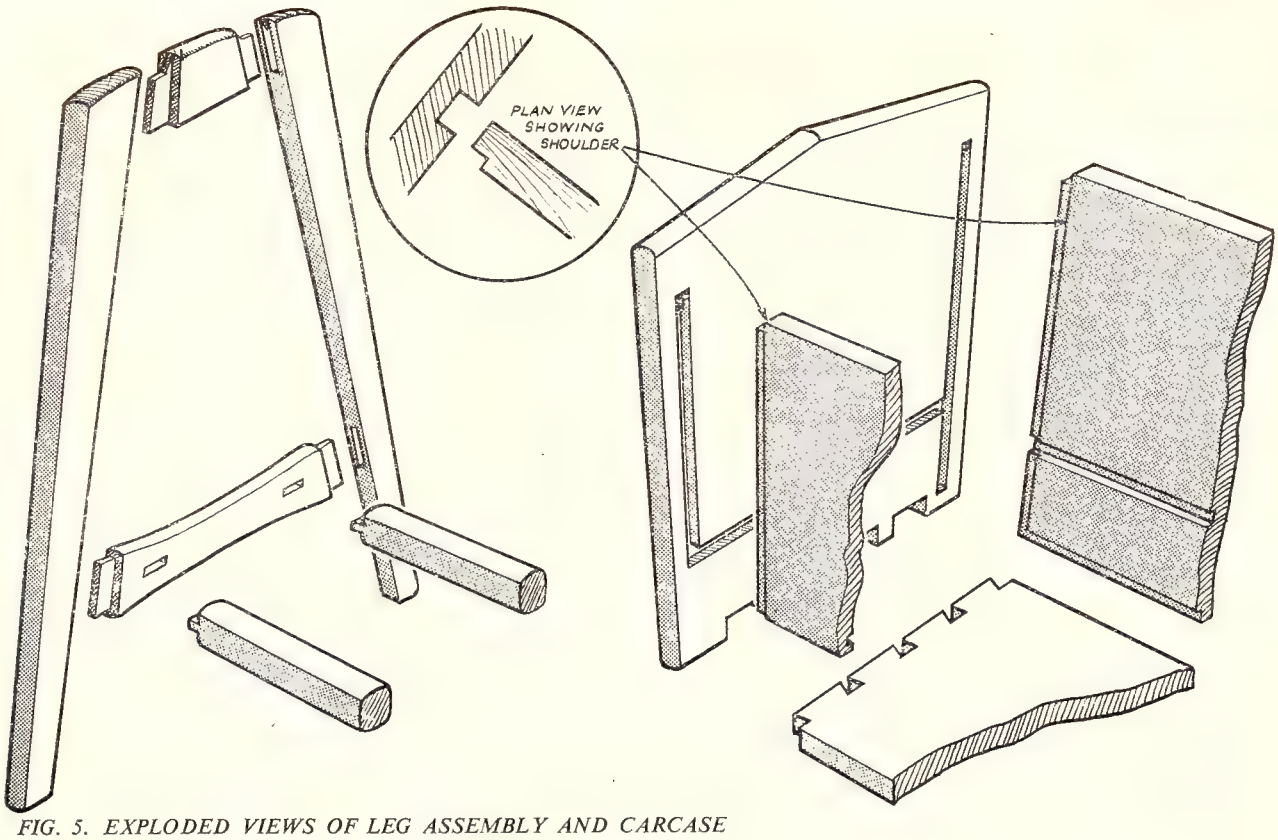


FIG. 5. EXPLODED VIEWS OF LEG ASSEMBLY AND CARCASE

drawers have been fitted the fronts can be veneered.

In the original the top was made from veneered chipboard lipped on all four edges. It was fixed to the carcase with $1\frac{1}{2}$ in. brass butt hinges and an elbow stay was fitted to prevent the top from opening more than 95-100 degrees.

Interior fitments

In the original a small tray was made to hold knitting needles, through dovetails being used. No details are given because of the simple construction. A partition was also fitted to provide a compartment for balls of wool. Two pockets were fixed to the underside of the top.

Cutting List	*Long*		*Wide*	*Thick*
Carcase	*ft.*	*in.*	*in.*	*in.*
2 Ends (chipboard)	1	$1\frac{1}{2}$	$12\frac{1}{2}$	$\frac{3}{4}$
1 Back	1	$8\frac{3}{4}$	$11\frac{3}{4}$	$\frac{1}{2}$
1 Front	1	$8\frac{3}{4}$	$8\frac{3}{4}$	$\frac{1}{2}$
1 Top (chipboard)	1	8	12	$\frac{3}{4}$
1 Interior bottom	1	$8\frac{3}{4}$	$8\frac{3}{4}$	$\frac{1}{2}$
1 Bottom	1	9	$7\frac{1}{2}$	$\frac{1}{2}$
1 Dividing rail		$3\frac{3}{4}$	$1\frac{3}{4}$	$\frac{1}{2}$
1 Guide rail		$6\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$
Leg Assembly				
4 Legs	1	$7\frac{1}{2}$	$1\frac{3}{4}$	$\frac{3}{4}$
2 Top rails		5	2	$\frac{3}{4}$
2 End rails		$10\frac{1}{2}$	$1\frac{3}{4}$	$\frac{5}{8}$
2 Tie rails	1	11	1	$\frac{3}{4}$
Drawers				
2 Fronts		$10\frac{1}{4}$	$3\frac{1}{4}$	$\frac{3}{4}$
2 Backs		10	$2\frac{1}{2}$	$\frac{1}{4}$
4 Sides		8	$2\frac{3}{4}$	$\frac{1}{4}$
2 Bottoms (plywood)		7	8	$\frac{1}{8}$

Scrap pieces for drawer slips, guide and lipping pieces.

Allowances have been made in lengths and widths; thicknesses are net.

The finish

The top and ends were stained dark, while the back, front and legs were left natural. The whole job was then polished using clear french polish. It was found easier to polish the carcase and the leg assembly separately and then to screw them together when finished.

(446-566)

FIG. 6. WORKBOX WITH LID OPEN

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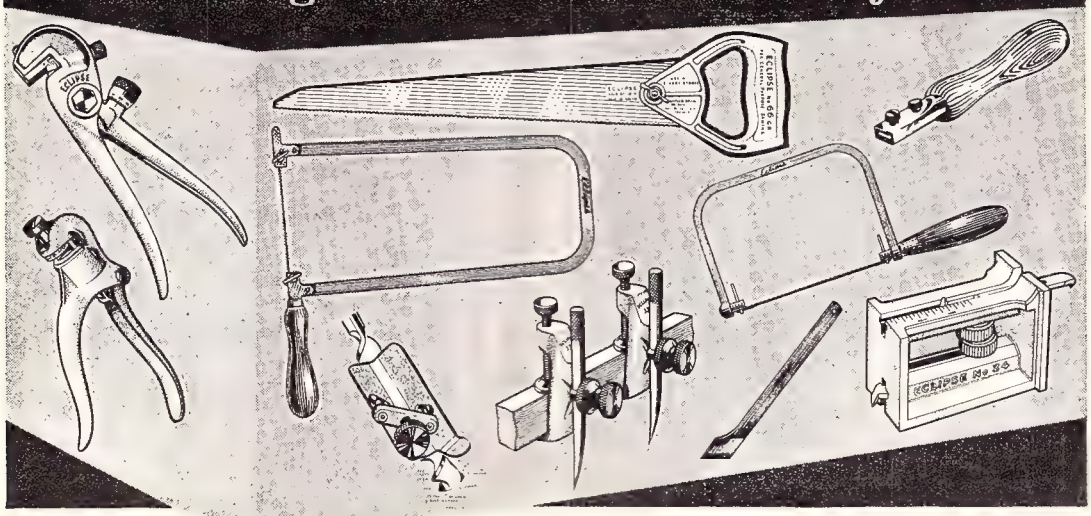

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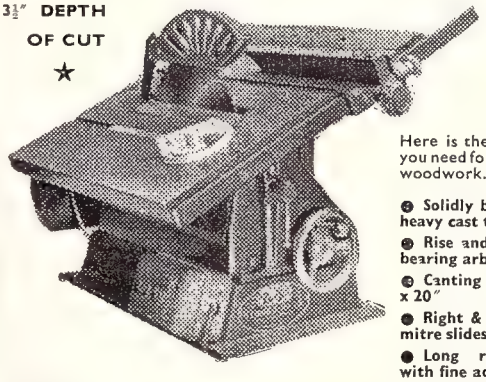

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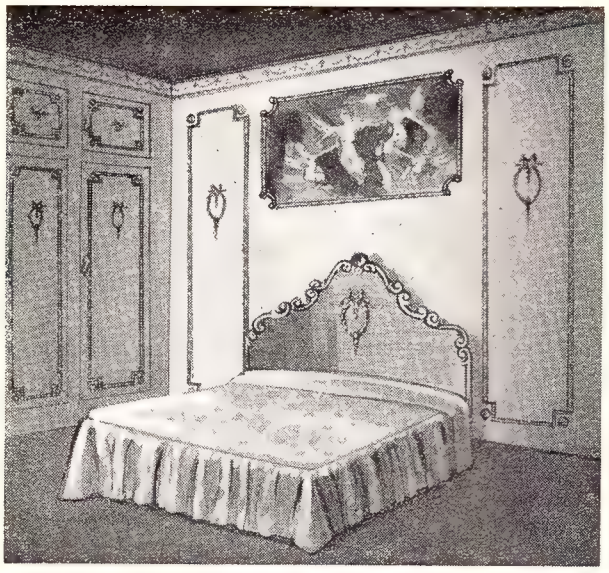

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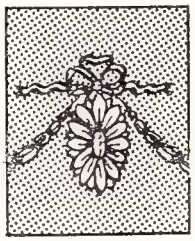

But most attractive of all, from the user's point of view, is that they can be pinned to any workpiece (built-in wardrobe, headboard, pelmet, frieze and so on) or quickly and cleanly fixed with contact adhesives. They can also be heat-formed.

What sort of finish can they take? There are no limitations because 'Shortwood' Carvings take any type of paint—emulsion, oil or cellulose. (Emulsion paint makes an ideal under-coat). And they can be grained, or varnish-stained and polished.

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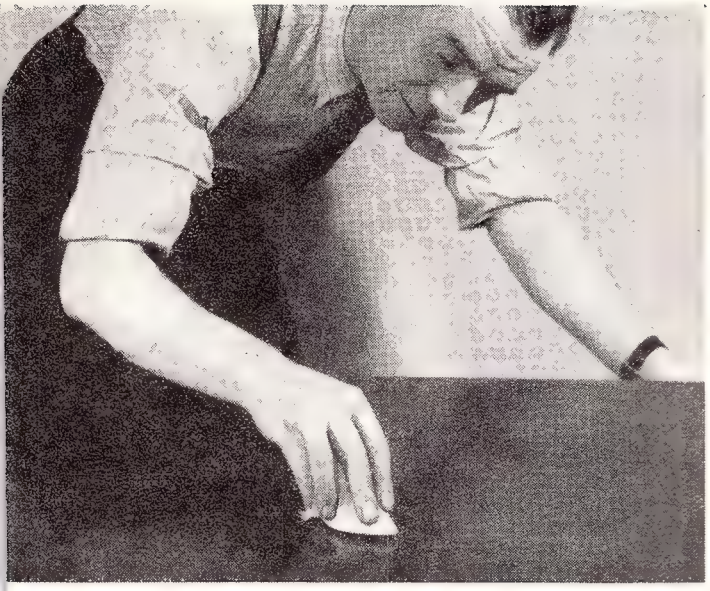


FRENCH POLISHING. Note the shape of the rubber and the method of holding it.

THERE ARE MANY readers who do not favour a bright finish to their work, and it is true that many jobs look their best when the finish is of the satin or even the dead flat type. Nevertheless, we would regard as the ultimate test of polishing skill the ability to produce a mirror bright finish, and we would state further that readers unable to produce one have not yet mastered this craft.

The old character who instructed us in our young days thought that a high finish was not satisfactory until we could see our faces clearly in it. We therefore adopted a test of using a coin edge down and angled to the surface. When we could see the figures in the image clearly we reckoned that the finish was satisfactory. There is no doubt that the ability to use a french polishing rubber with precision is the foundation on which we must build. We shall therefore begin by discussing this simplest of all tools in detail.

The rubber is merely a piece of material about the size of a medium handkerchief with a core of wadding inside. It is important, however, to choose the right materials and to assemble them correctly. The covering cloth must be absorbent, with a fine texture and weave. Good cotton and linen are excellent, especially after having been washed several times. Cotton rayon mixtures or stockinet are first-class. Woolly or fluffy cloths must be avoided for obvious reasons. We do not fancy silk, artificial silk, nylon or terylene. They do not seem to get a hold of the surface. The core or fad of the rubber is made from unbleached wadding. Bleached wadding such as medicated cottonwool is unsuitable. It does not have the resilience of the unbleached type, and quickly compresses into a hard, unyielding lump without the necessary spring.

Having selected the materials we must now assemble them correctly. Small rubbers are sometimes necessary for special purposes but are tiring to the hand and wasteful of effort. Our hands were once described by our aforementioned master in one of his more facetious moods, as being like number ten shovels; so the rubbers we make up for ourselves are comparatively large. The size, however, is not critical so long as it suits the operator. We stress this point because it is important. Handling a french polishing rubber is tiring at first. But this soon passes with practice.

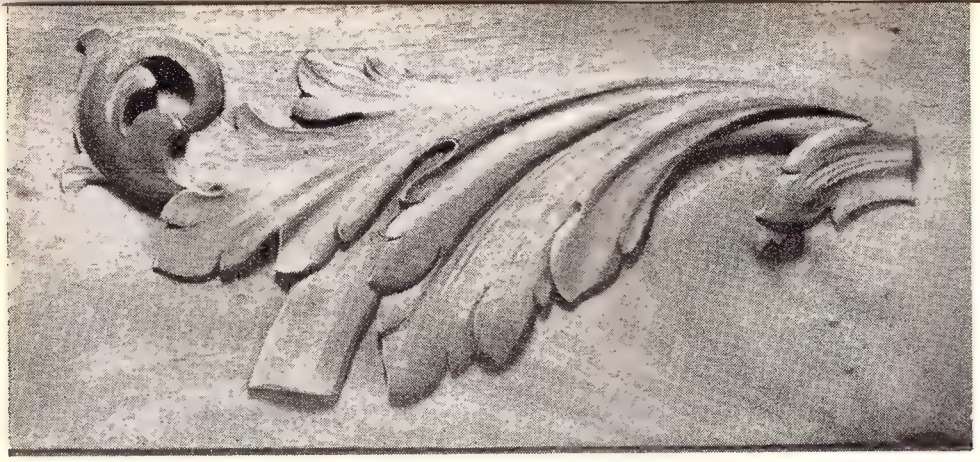
Unbleached wadding is used by tailors and can be bought cheaply at appropriate stores; or it can be bought in balls from many drysalters. Either way it is a mistake to tease the wadding into little bits and assemble these. Such a rubber would be lumpy and would not apply an even pressure over the business part. It is necessary to keep the material in layer form as far as possible. Have the base part at least from a continuous piece, and fold or build around this to give a shape like a pear cut along its axis. This is placed on the covering cloth which is then wrapped around and secured by twisting the ends together. The method we use is to set the cloth flat, diamond fashion, with the fad in the middle, point towards the furthest corner of the diamond. We fold this corner towards us, then the right corner to left firmly, and left over right. We then take the pear-shape in our left hand, and with our right twist the four ends together clockwise, so that the pad is held firmly. Some squeezing on the bench top flattens the face and the rubber is now ready for action.

Tools have a habit of telling the operator when they need attention, and this one is no exception. If not assembled well the face will keep wrinkling in protest. The core of the rubber will last for long enough, but the covering cloth soon wears through and must be replaced. A common failing is to make rubbers like little suet puddings. These do not fit the hand comfortably. If you put your hand in the attitude for holding a rubber, it will itself look pear-shaped from both top and underside. In action a point is necessary to get into corners.

Having mastered the trick of making a rubber the next thing is to learn how to look after one. It was a heinous offence for us to leave one lying around. Left this way a rubber soon becomes hard as a stone and no amount of soaking and manipulating will restore its original condition. One so neglected is best thrown away. At the same time remember you will be throwing away money, since it will contain about a shillingsworth of shellac. Rubbers are best stored in a glass jar with a screw lid. This will keep them safe and ready for use for long enough. It is a mistake to use a tin. This will soon rust, and rust can do some queer things to wood.

Like all craftsmen, polishers have their own little tips and fancies and ways of doing things. There are some who prefer a velvet or velveteen covering cloth, especially for finishing stages and, although we do not fancy these ourselves, we have seen some classy jobs done with them. The big danger is the tiny hairs, which must be securely seamed in around the edges. When the body of the film is being built, some like to use an occasional sprinkling of fine carborundum under the cover and on the face of the fad. This type of rubber is called a grinder, and its purpose is to keep the film flat and thin, and to force the shellac into the pores to obtain a full grain finish quickly.

It is necessary to have several rubbers for different purposes. We always make up new ones for a light or bleached job. These will be used next for darker type finishes and finally, when we think they have earned their keep sufficiently, we burn them. (422-534)



WOOD CARVING

6. Acanthus leafage

by WILLIAM WHEELER, A.R.C.A. (Lond.) Member of the Board of Studies, City & Guilds of London Art School.

FIG. 1. BOLD AND VIGOROUS TREATMENT IN GRINLING GIBBONS' STYLE

THE PROBABILITY IS that the acanthus leaf has been more widely used in carving than any other motif. Invariably it is in conventional form as distinct from the naturalistic, and its form and treatment varies with the period and style. Sometimes it is highly stylised with square, spiky lobes as in Byzantine ornament, and in others it is used with elaborate scroll work so that it is difficult to tell where the natural ceases and the artificial begins. One feature, however, which seems to be common to all is that the leaf has pointed or rounded lobes, and is usually compound in that it is made of several smaller groups of lobes which join together and flow from one common vein. The groups nearer the stem tend to overlap those beyond, hence the typical arrangement of eyes and pipes at the juncture of the lobes. Fig. 1 shows the idea.

The emphasis given to these details, the degree of modelling, and the shape of the leaves varies with the style and period of the work.

The stages in working the leafage in Fig. 1, based on the Georgian style, are shown in Figs. 3 to 6. The form is quite bold with well-defined shapes and pronounced modelling. The panel of any material measures about 13 in. by 6 in. and is typical of the decoration that might have been used on panel headings, fitments, and general joinery in the first half of the eighteenth century. The wood is 1 in. thick and the background is cut back to about $\frac{3}{8}$ in.

The design

The design is first drawn out on paper (Fig. 2), care being taken to produce a natural flow to the leaves and to avoid a disjointed appearance. It is worth while spending time on this all-important work because no excellence of execution can compensate for poor design. When satisfactory the design can be transferred to the wood with carbon paper. Preserve the original drawing because the marks on the wood are inevitably lost when the surface is modelled later, and it is useful to have the drawing as a guide.

Grounding

The recessing of the groundwork is the first operation, and this necessitates marking a line around the edges. It can be either gauged in or marked with pencil by the finger gauge method. Working from the edges inwards, use a fairly large half-round gouge such as a $\frac{3}{4}$ in. No. 9. The cuts can run out to the surface as the outline of the pattern is approached. It is easier to cut across the grain

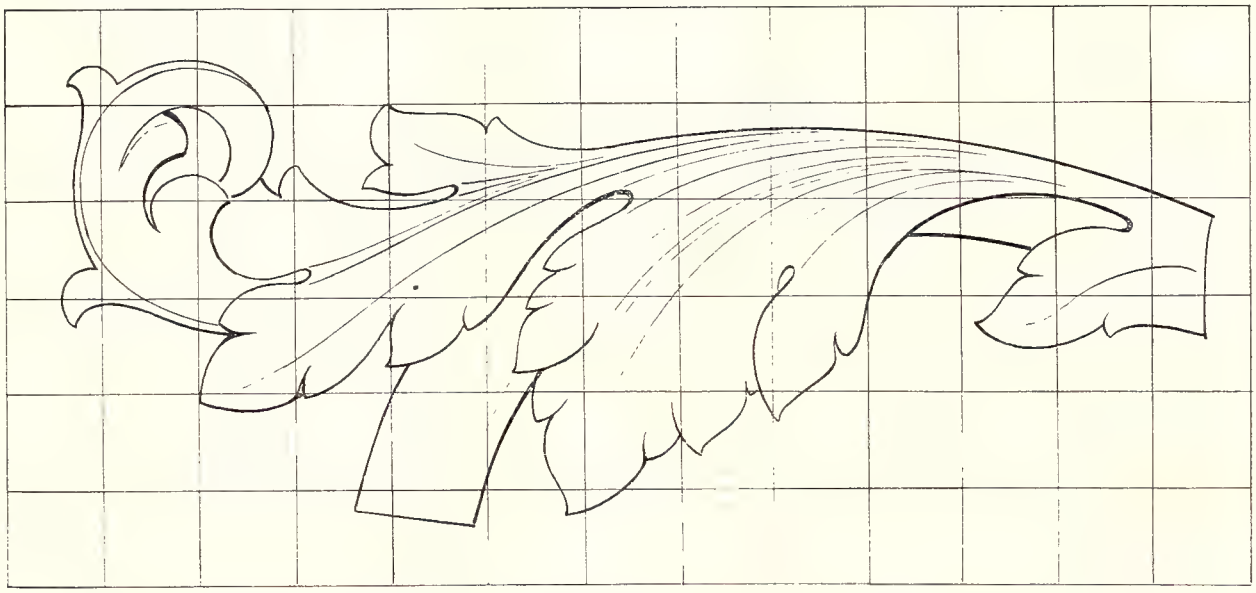


FIG. 2. THE DESIGN DRAWN OUT IN 1-INCH SQUARES. IT CAN BE COPIED MAP FASHION

as it is less laborious and not so likely to splinter out the grain.

When roughed out in this way run around the pattern with a quick gouge or fluter (about $\frac{1}{4}$ in.), working approximately to the shape but omitting all detail, and keeping about $\frac{1}{16}$ in. or $\frac{1}{8}$ in. from the line as in Fig. 3. The idea is to make the cut on the waste side so that the outline can be set in with gouge and mallet, the wood crumbling away on the waste side.

Setting in

With a fairly large flat gouge and using the mallet, cut in all round the main pattern, approximating the shape to the outline but omitting all small detail as in Fig. 4. Stop slightly short of the finished depth because the leafage has to be undercut later, and it looks bad to show tool stab marks on the groundwork. A fairly large flat gouge can now be used to make the groundwork flat down to the pencil or gauge line (Fig. 4).

Modelling

Before any detail is put in the whole of the leafwork should be "bosted" or "roughed" in, making sure the highest parts i.e. the top of the turnover and the main piping are untouched at this stage. Also make a point of getting down to the lowest level like the underneath of the turnover and the small spray of foliage nearby. Do not leave a little extra "in case you spoil it". This has already been provided for in the first stage of the groundwork yet to be cleared up. Remember you have given yourself a $\frac{1}{2}$-in. relief carving to carry out, and you want to see the general effect in that relief before proceeding with details. In other words, make good use of the $\frac{1}{2}$ in. In getting down to the lower part you will automatically "bost in" the intermediate modelling without concern of detail. This is an absorbing and interesting stage in all carving whether it be in relief or in the round, apart from increasing your confidence in free and bold cutting. Cut in the "eyes" of the leaf at this stage for it does establish permanent marks on which you can rely when redrawing the foliage on the wood, which a carver is continually doing whatever stage he is working on. The small fluter, about $\frac{1}{8}$ in. across the opening, does the eyes well. Gouges of various sweeps can be used for the modelling and a fluter for bringing up the pipings. Also, emphasising the main line leading to the turnover at the back gives an additional quality.

Good sweeping lines, with the tools mentioned give a rhythm to the job, which you should feel when cutting.

Do not try to make the surface dead smooth—tool marks give character to the work, though they must not be too coarse. Where the parts lie one over the other try to keep what would be a natural form. Thus the lobes at each side of the wide main stem should drop down to the groundwork as if by their own weight. Characteristic of this ornament is the rather blunt, rounded finish of some of the lobes which give added interest to the work. These are produced by using the inside of, say, a No. 3 or 4 gouge well bevelled on the inside.

At this stage the final outline and undercutting of the leaves can be completed, and the groundwork flatted to meet it. Finally a few deft cuts with a veiner along the direction of the leaves sharpens the whole and gives a sense of continuity and flow to the leaves. These cuts need to be made carefully but with confidence, and should be made in the required direction in a single continuous movement. If in doubt as to the final direction lightly pencil in the marks first. Figs. 5 and 6 show the further stages of the work towards its completion in Fig. 1.

(421-540)

FIG. 3. GROUNDWORK ROUGHLY RECESSED

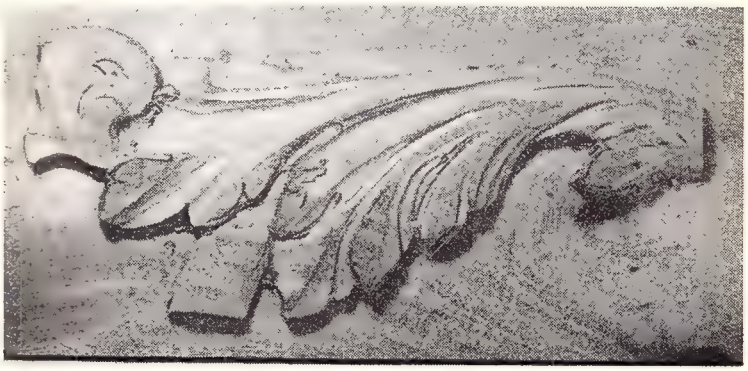


FIG. 4. THE LEAFWORK BOSTED IN

FIG. 5. PROGRESS IN THE MODELLING

FIG. 6. THE OUTLINE SET-IN AND UNDERCUT

WORK IN THE COL

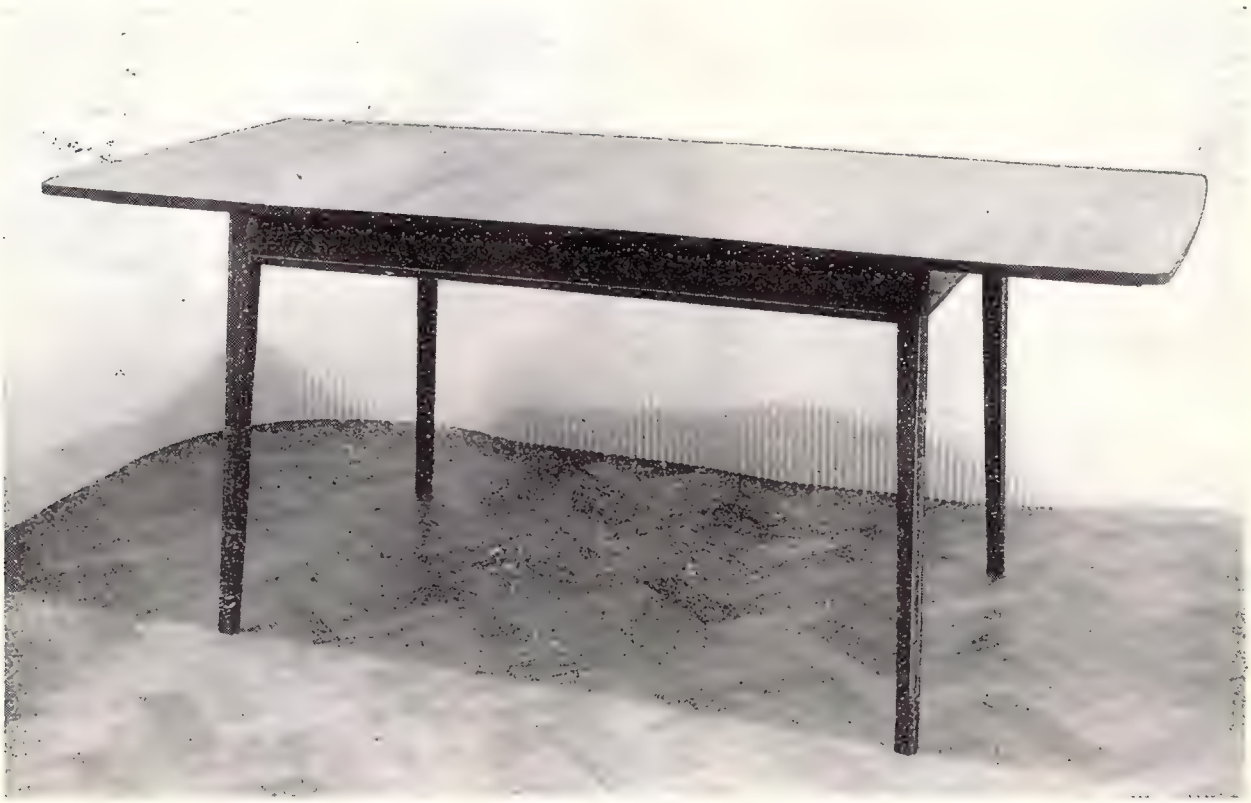
L

BOW FRONTED DRESSING TABLE IN AFRICAN WALNUT (above)
Made by D. C. MAUND

IN THESE DAYS when few things are made to last, and when so much is sacrificed to economy, it is a wonderful relief to turn to places where good design and sound craftsmanship still stand for something. It is largely in our technical schools that the spirit of integrity is maintained, and we are therefore beginning this series in which we illustrate some of the items made by students during their terms of work. This month we begin with Loughborough Training College, where students are trained to become teachers with a particular bias towards handicraft.

We would like to point out that in those schools intended to help students entering the trade, machine work is taught as well as hand work; and rightly so, because a man has to learn the potentialities of the machine. Even in workshops where hand work is largely practised, the timber is originally converted by machine saw and often thicknessed on the planer. There is nothing against the machine when intelligently used—in fact there are many jobs which it will do far better than a man can hope to do by hand. It is only when design is sacrificed, or when construction is allowed to deteriorate to enable a machine to be used, or when the nature of wood is disregarded that the mischief comes in.

In addition to the work of the schools we hope to give examples of quality work made in trade workshops, and would welcome photographs of fine woodwork. In the meantime we are grateful to those who have been good enough to give us the facilities for publishing photographs of work made under their guidance.

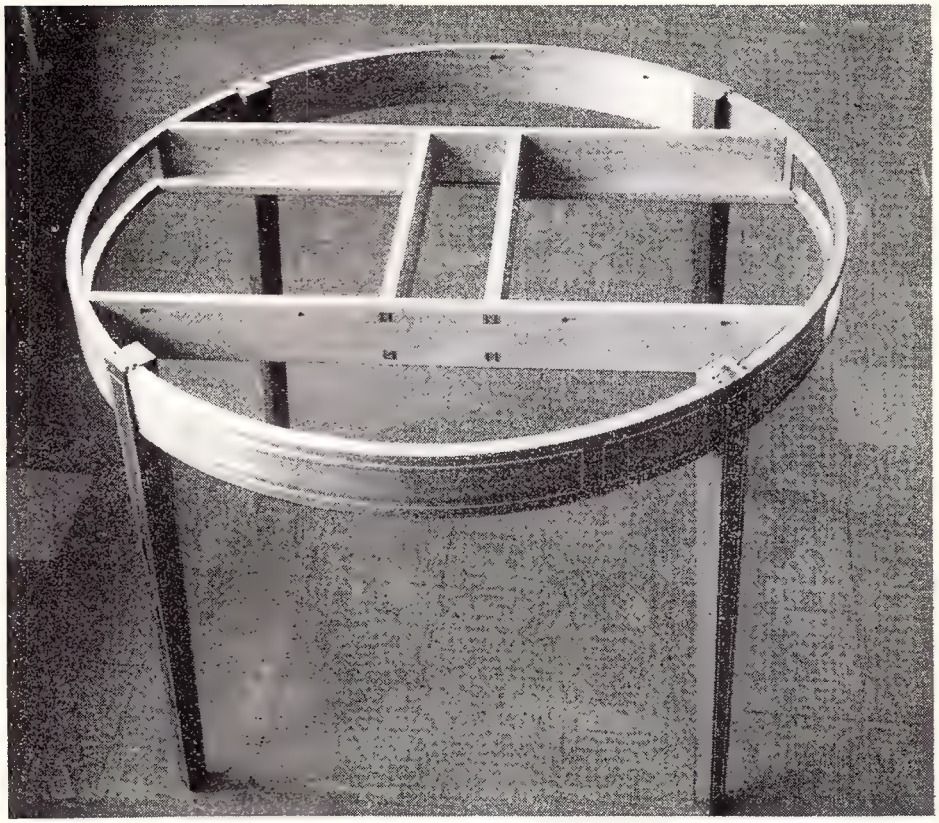


GES

GHBOROUGH TRAINING COLLEGE

CHERRY WOOD ROCKING CHAIR. THE ARM SUPPORTS ARE LAMINATED FROM ⅛ IN. THICK STRIPS, THE ROCKERS SHAPED FROM THE SOLID. UPHOLSTERY SUPPORTED BY RUBBER WEBBING

Made by D. L. NOBLE



CIRCULAR TABLE FRAME (right) IN TEAK INLAID WITH SYCAMORE. THE RAILS ARE LAMINATED FROM ⅛ IN. THICK STRIPS AND ARE TWIN TENONED INTO THE LEGS

Made by J. LORD-HATTON

EXTENDING DINING TABLE (left) IN TEAK WITH HOLLY INLAY. THE CENTRE LEAF WHEN LIFTED AUTOMATICALLY FOLDS AWAY BELOW THE LEVEL OF THE MAIN TOP. THE LEGS ARE MOULDED AND INLAID

Made by C. J. COLSTON

CHAMFERING

by R. WEARING, D.L.C., M.Coll.H.

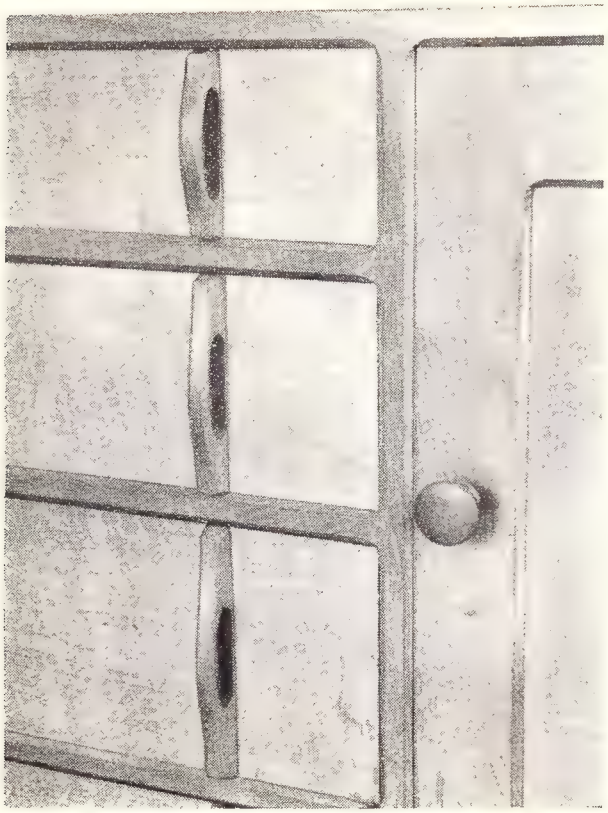
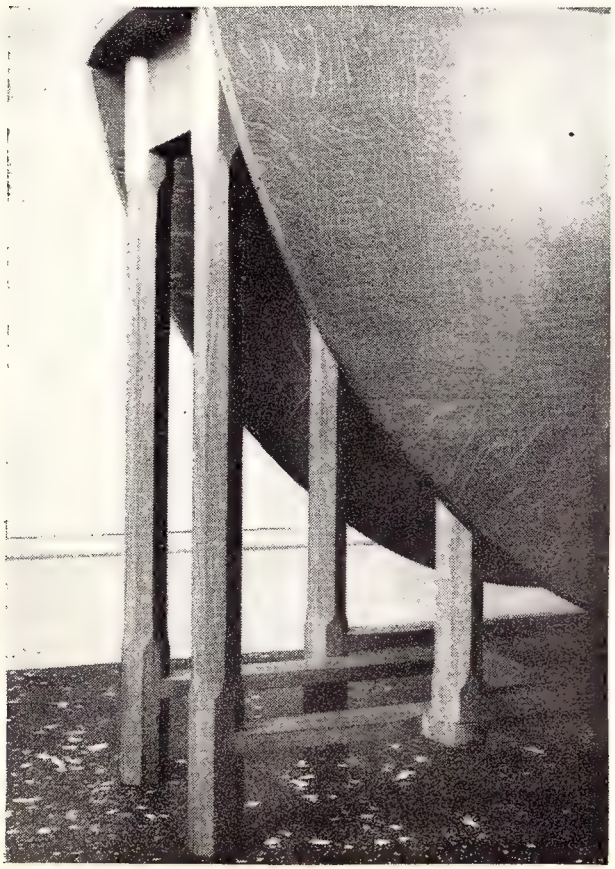


FIG. 1. CARCASE CHAMFERS

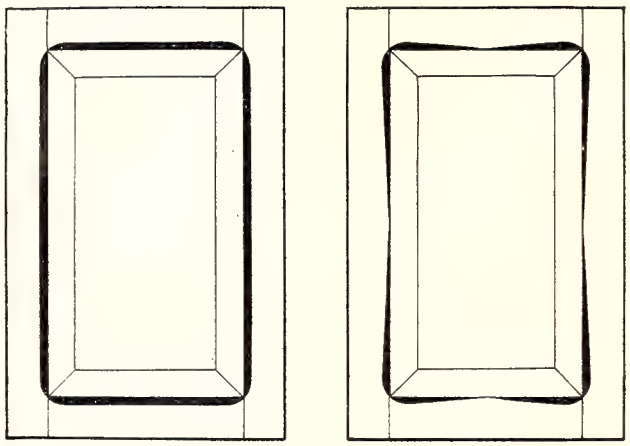
FIG. 2. LEG AND RAIL CHAMFERS



Chamfers are properly cut with a drawknife on the separate pieces after a trial assembly, but before final assembly and gluing up. On the proper structures they are a concise and bold decoration.

THE CHAMFER, LIKE the common dovetail, is the mark of the hand craftsman. It can scarcely be produced by machinery, certainly not in any variety. It comes to us making furniture today in a rather roundabout way.

The fine tradition of English furniture-making had largely been destroyed by the industrial revolution. At the turn of the century a group of young architects, the brothers Barnsley and Ernest Gimson, inspired largely by the teachings and writings of William Morris, set up workshops in the Cotswolds, and there they set to work to rediscover the art of fine furniture making from the beginning. They were much inspired by the country craftsmen round them, men so far untouched by industry and mechanisation. These were the wheelwrights, the builders of waggons, the joiners and carpenters who make the gates, ladders, tools and barns, and all the other wooden necessaries of rural life. These men used the chamfer much, both to lighten the load of a horse by chamfering away surplus timber on a waggon, or by chamfering gates so that the rails shed water instead of holding it. They had an eye too for the aesthetic appeal of a well-cut chamfer. The chamfer was used greatly on the furniture of what is now called the Gimson tradition, and has continued to be used by the artist craftsman or the individual designer craftsman ever since. It has scarcely at all been used in commercial mass-produced work. It is a skilful and rewarding exercise and gives to a piece a character unique compared with the manufactured article. And very English, for the chamfer is at its best on the English woods, oak, walnut, sweet chestnut, elm and ash. Generally speaking, it does not succeed when done on



SOME VARIATIONS OF CHAMFER

imported woods of the mahogany type. It is a rugged treatment and demands a rugged timber.

The appeal of the chamfer is a matter of light and shade. The essential, therefore, to prevent the dark and light merging into indistinctness is crispness. Chamfers must be decisive, crisp and clean. Where they run straight they must be really straight, and when they run round a corner they must do so confidently in one sweep.

The photographs show various applications of the chamfer. Fig. 1 depicts a carcase job, a sideboard using the chamfer as the main decorative feature. Drawer fronts and panels are completely plain but all the openings for panels, drawers and doors are relieved by chamfers which run out at the corners. This gives a pleasant roundness to what is basically a very angular construction. Wherever the light source may be, it throws up some of the chamfers clear and dark. Fig. 2 shows table construction. Octagonal legs, by means of a chamfer, have the appearance of being rotated a half turn. The vertical lines and shadows have a slenderising effect on the legs. The under rails, too, are visibly thinned by a flat chamfer. Fig. 3 is of an octagonal leg on a centre pedestal table which has been chamfered twice to give double the effect of that shown in Fig. 2. Such chamfers must be bold or the effect is lost. They must also be well executed. Fig. 4 shows on a chair-back how the basic rectangular shapes are pleasantly rounded by bold chamfering. All these are cut before assembly.

There are two problems in chamfering, marking out and cutting. Although the very experienced man can cut them well with no marking out, those with less practice will find a couple of chamfer gauges well worth making, Fig. 5 shows these in more detail and gives a formula for any size of chamfer, saving time spent on trial and error methods. Gauges must always allow for the thickness of the pencil, and must not be used until joints have been fitted up dry, cramped, and skimmed level.

Several authoritative works on cabinet making describe chamfers as being cut with rasps, files, glasspaper, and spokeshaves after gluing up. This is quite wrong. Chamfers are cut with a drawknife. The small cabinet maker's model, not the vast wheelwright's model which one sees so often in school and evening class workshops. It must be sharp yet not have too acute a bevel. It needs a stubby bevel on which to run round the curve. For one or two chamfers a chisel with a very short bevel may be used, but there is no real substitute for the drawknife. Between the curves the wood can be removed in several ways. The end

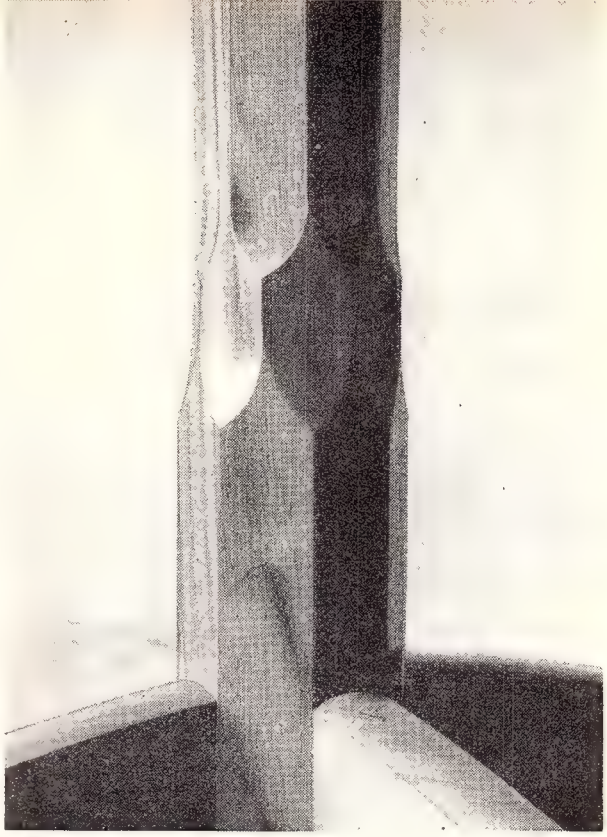
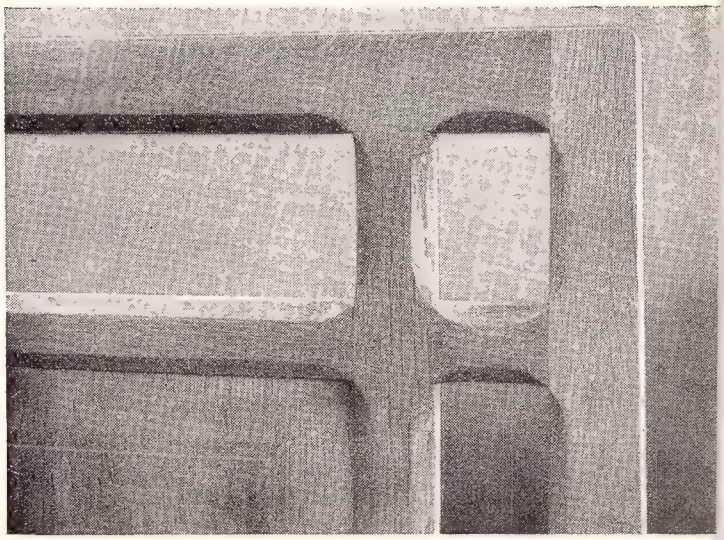


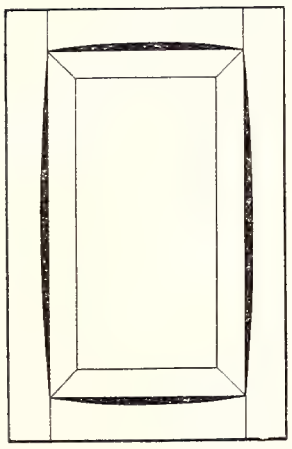
FIG. 3. DOUBLE CHAMFERS ON A PEDESTAL LEG

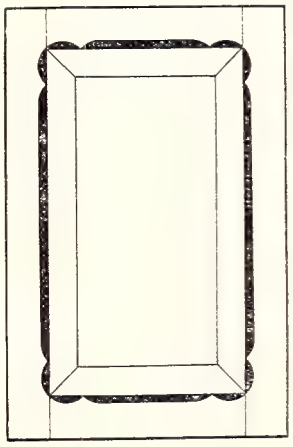
probably justifies the means. The flat-faced metal spokeshave for short runs, the block plane, smoothing plane or bullnosed plane for longer runs, all have their place. There is, however, always the danger that the sharp edge of the metal spokeshave will damage the crisp curved corner cut by the drawknife. For that reason it is as well

(*Continued on page* 203)

FIG. 4. CHAMFERING OF CHAIR BACK







HAND AND MACHINE TOOL SHARPENING

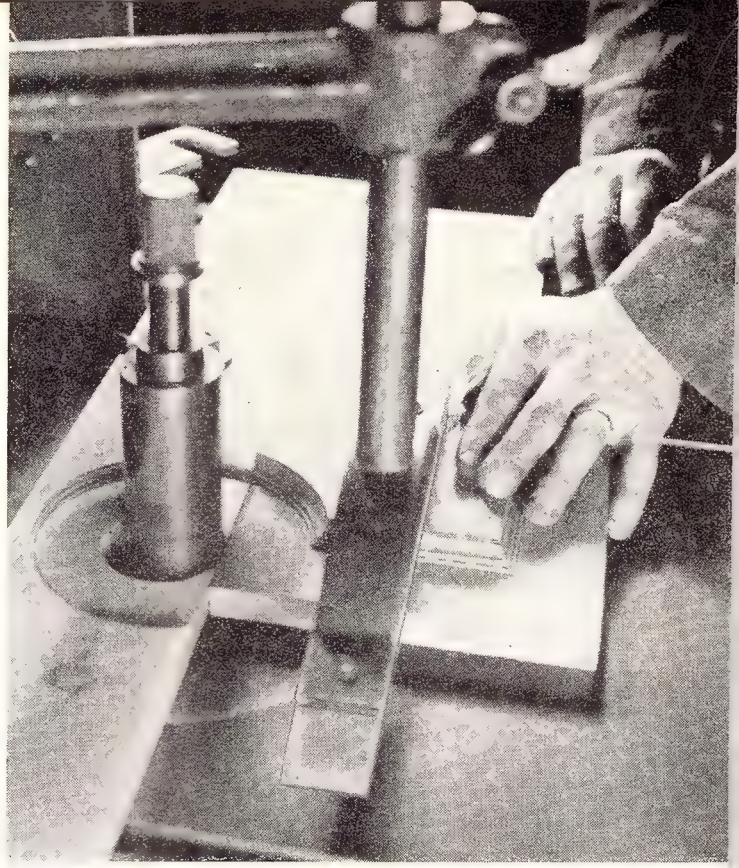
8. French spindle cutters (continued)

by GEORGE J. J. TURNER, A.I.M.Wood.T.

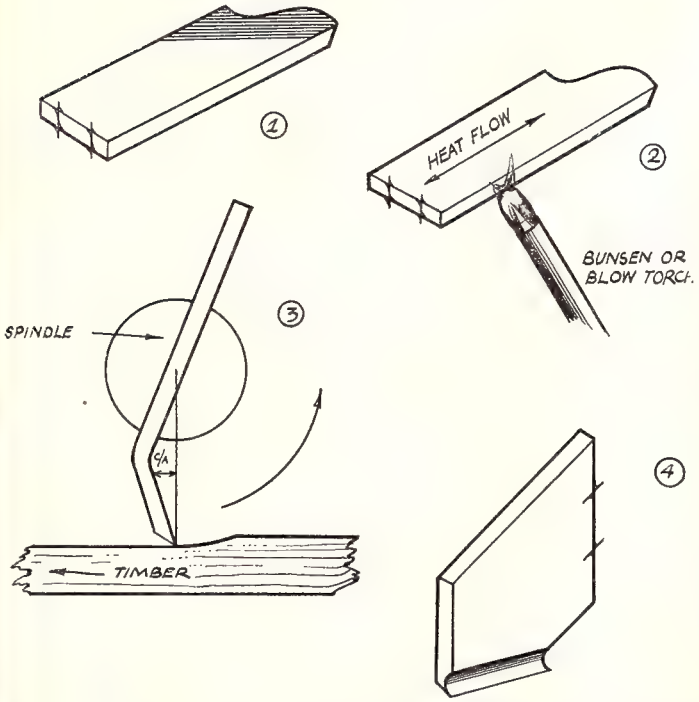
A COMMON PROBLEM facing the machinist when using the French spindle is that of obtaining a good finish on woolly timbers using standard cutter steel. The answer lies in hardening and tempering the steel so that the cutter takes a much keener edge, thereby severing the timber fibres cleanly instead of pulling at them. With a hardened and tempered cutter the most difficult African mahoganies can be worked to a good finish even on shaped work where some cutting will occur at an angle to the grain.

Hardening

The preparation of the cutter must be made with care and understanding since any brittleness will lead to probably fracture of the cutter when operating. It is wise to grind the cutter to shape before hardening as there is then more freedom on the grinder. There is no bother of thoughts of overheating and drawing the temper. Having shaped the cutter and cleaned up the face side a source of heat is required and something modest such as an efficient blow-lamp or bunsen burner will suffice. The cutting edge is held in the flame and brought up to cherry red heat as in Fig. 1, at which stage the tool is withdrawn and plunged quickly into clean, cold water. This heat treatment will have made the cutting edge extremely hard but also very brittle; the shank remains tough and unhardened.



THE FRENCH SPINDLE IN ACTION



DETAILS OF SHARPENING FRENCH SPINDLE CUTTERS

1. Area of cutter (shown shaded) which is heated to cherry red 2. Tempering. Heat is directed to back of shank. 3. Cutting angle obtained by bending the tool. 4. The cutter fluted for fielding

Tempering

The next operation is to lessen the hardness of the edge sufficiently to prevent the possibility of fracture and to allow the turning over of the edge with the burnisher. To do this, play a small flame on to the back of the cutter and allow the heat to flow through to the edge as in Fig. 2. This ensures thorough tempering of the core of the steel. Judgment of temper will be governed by the formation of colours on the previously cleaned-up cutter face, oxides which form at certain temperatures. The first colour to be seen, as most woodworkers will know, is a light straw, an ideal temper for a paring chisel but too brittle for French cutters. Hold the cutter in the flame until the face shows a bright blue film and allow this colour to flow along to the edge when the tool is quickly quenched in cold water. The cutting edge will now be much harder than originally but suitable in every way for French spindle work. Final sharpening is best completed with an oilstone slip as the harder steel would have a dulling effect on Swiss files.

Burnishing

Having brought the cutting edge to maximum sharpness, free of all burr or whiskers the burnisher is used at half the clearance angle to lay the edge over. Heat treatment of French spindle cutters requires such little time and equipment and the results are so beneficial that one wonders why it is not more popular.

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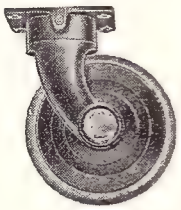

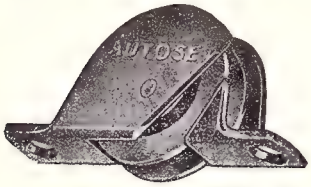

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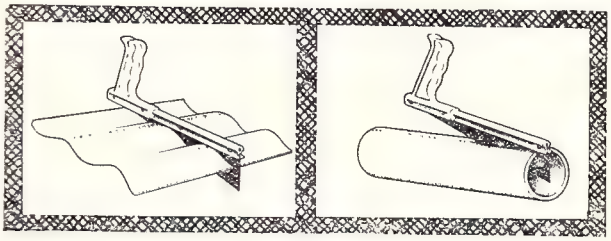

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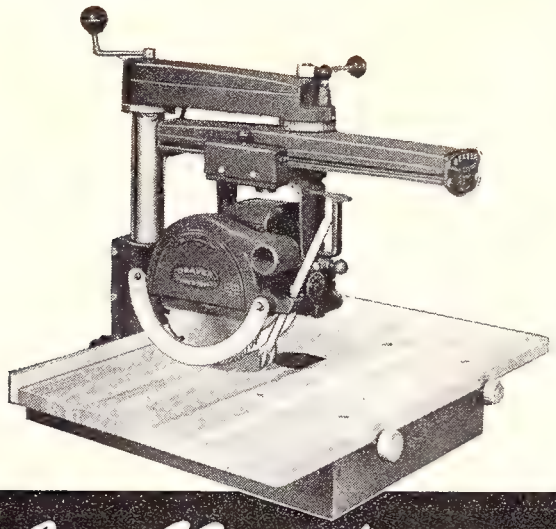

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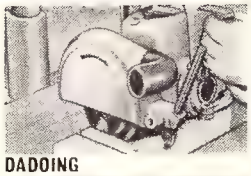

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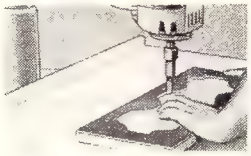

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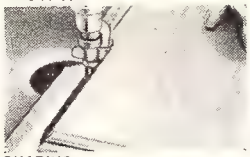

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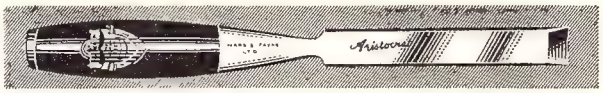

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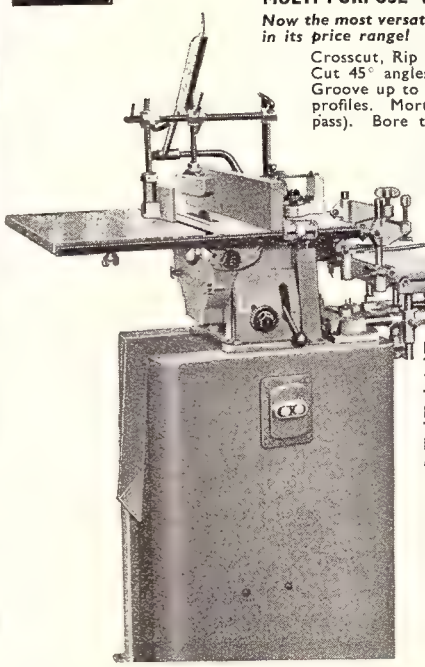

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High Speed Steel

A simpler but more expensive method of dealing with woolly timbers is the use of French cutter material which has a high speed steel facing welded on to a mild steel backing. In this material the mild steel resists the impact of cutting while the high speed steel provides a hard, keen edge. High speed steel itself would be quite unsuitable due to its brittle nature.

Incidentally it is quite a common practice in industry for machinists to use worn out and discarded mill saw files in an effort to gain a durable sharp edge. This is something to be condemned unless heat treatment is used to draw the temper of the file, in which case one might just as well use the standard material. True, the piece of file will hold a keen edge but it is far too brittle a material for safe use. Referring to the high speed steel faced cutter steel, it is often used with no burr or lay-over of the cutting edge with satisfactory results. Nevertheless much better results will be achieved if a very light burr is given, the steel being too hard for normal burnishing. A very light burr on high speed steel will have a longer life than a heavy one on carbon steel, due to its superior qualities as a cutting medium.

Abrasive woods

A second problem confronting the French spindle machinist is how to prepare for such timbers as teak where the material is so abrasive that a few inches of cutting is enough to ruin the edge of the tool and cause burning. Here there is no complete solution but if the cutters are ground with a very steep bevel and used direct from the grinder with no further sharpening or burnishing satisfactory cutting will be obtained. The grinding burr will be found to have a reasonable life and there will be no burning, though the finish on the timber is of fair quality only, necessitating full use of glasspaper prior to polishing.

In many examples of French spindle work it is an advantage to use a cutting angle but with no burr applied to the cutting edge. We then have a tool which will stand up to a longer run of work and accept a faster feed speed. Cutting angle is obtained by suitably bending the cutter, but it is essential to realise that, by introducing or increasing the cutting angle, some distortion of shape will occur; i.e., the cutter will not register its true shape on the timber. The bend must be made when the steel is at red heat and the cutter should be reheated and allowed to cool slowly to relieve all stress. Fig. 3 shows how the cutter enters the timber at a favourable approach angle, obtaining greater efficiency than the conventional French spindle set-up.

A method of introducing cutting angle when fielding panels is shown in Fig. 4. In this case a flute has been ground in the face of the cutter and a very sharp edge results. Hardened and tempered, such a tool would have a satisfactory working life and produce particularly clean surfaces. (440)

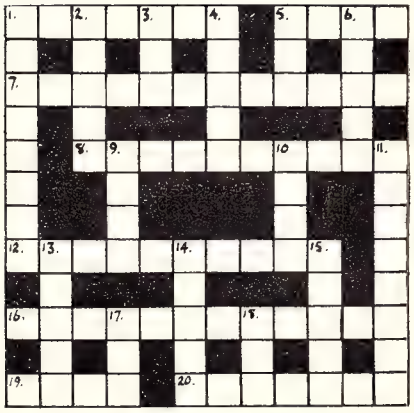
POLISHING IN THE LATE EIGHTEENTH CENTURY

Extract from Sheraton's Cabinet Dictionary

"Sometimes they polish with bees-wax and a cork for inside work, where it would be improper to use oil. The cork is rubbed hard on the wax to spread it over the wood, and then they take fine brick-dust and sift it through a stocking on the wood, and with a cloth the dust is rubbed till it clears away all the clammings which the wax leaves on the surface.

"At other times they polish with soft wax, which is a mixture of turpentine and bees-wax, which renders it soft, and facilitates the work of polishing. Into this mixture a little red oil may occasionally be put, to help the colour of the wood. This kind of polishing requires no brick dust; for the mixture being soft, a cloth of itself, will be sufficient to rub it off with. The general mode of polishing plain cabinet work is, however, with oil and brick-dust, in which case the oil is either plain linseed or stained with alkanet root. If the wood be hard, the oil should be left standing upon it for a week; but if soft, it may be polished in two days. The brick dust and oil should then be rubbed together, which in a little time will become a putty under the rubbing cloth, in which place it should be kept under the cloth as much as possible; for this kind of putty will infallibly secure a fine polish by continued rubbing; and the polisher should by all means avoid the application of fresh brick-dust, by which the unskilful hand will frequently ruin his work instead of improving it; and to prevent the necessity of supplying himself with fresh brick-dust he ought to lay on a great quantity of dust, carefully sifted through a gauze stocking; and he should notice if the oil be too dry on the surface of the work before he begin, for in this case it should be re-oiled, that it may compose a sufficient quantity of the polishing substance, which should never be altered after the polishing is commenced, and which ought to continue till the wood by repeated friction become warm, at which time it will finish in a bright polish, and is finally to be cleared off with the bran of wheaten flour."

WOODWORKER CROSSWORD PUZZLE R/62031



Clues

ACROSS

1. Plenty of body in this framework. (7)
5. The whole structure rests on this. (4)
7. Necessary if you wish to protect your design. (12)
8. Flies to and fro across the warp. (3, 7)
12. Cain, disturbed, among the apples, makes the sorts of things that are parts of bigger tools. (10)
16. Difficult to get on with, they produce a fine surface. (6, 6)
19. Player's share of cards comes from the fir. (4)
20. Circuit renewed when red wire is upset. (7)

(*Solution on page* 199)

DOWN

1. A car and a bun, oddly enough, produce wax. (8)
2. On the conservative side. (5)
3. Jaques' hypothesis was that any man should turn this. (3)
4. Where the fox is at home. (5)
5. Tool for the Twist? (3)
6. Plunders, goes in reverse to a backless seat. (5)
9. Ship's frame below Kingston. (4)
10. Vetch in Biblical guise. (4)
11. Wood of blackened character. (8)
13. Pouch would be pure with a bob in it. (5)
14. Boring tool. (5)
15. More sensible. (5)
17. The wind that brings no one any good. (3)
18. The pitch of the double bass. (3)

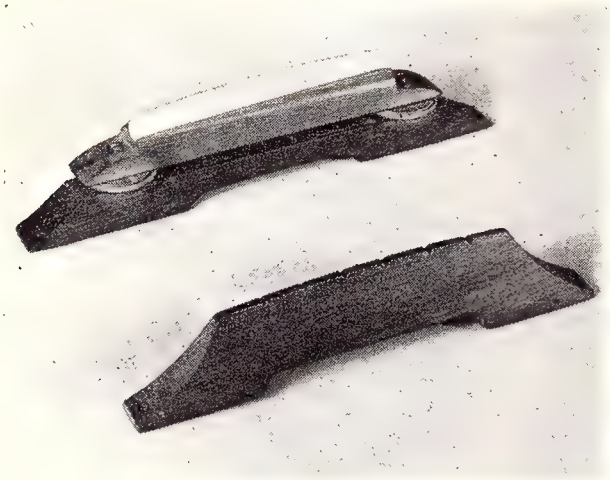


FIG. 1. (Top) ADJUSTABLE BRIDGE. (Lower) ONE-PIECE BRIDGE

SOLID ELECTRIC PLECTRUM GUITAR

by WILLIAM PRINCE

This completes the description of the solid electric plectrum guitar. Later we shall be dealing with the Hawaiian steel guitar—solid electric type.

WHEN MAKING AN acoustic guitar with a vibrating soundboard, it is essential to have the most responsive kind of wood for the bridge, but the solid electric guitar is not so discriminating in its requirements. For this instrument you may make the bridge entirely of wood (in which case only the very hardest close-grained materials are suitable) or of wood with a saddle of ivory, bone or hard white plastic. In the adjustable type of bridge shown in Fig. 3 there are also some metal parts.

The measurements shown in Fig. 2 are arbitrary, and you may vary them according to your design and the materials at hand, but to have sufficient stability the bridge should be of not less than $\frac{7}{16}$ in. thickness.

Before you can discover the correct height for the bridge, you will have to make the nicks in the nut for the strings. For this you need some needle files. For the wire-wrapped strings a mouse-tail file is necessary, and a knife-edged one for plain strings. First of all, allowing $\frac{1}{8}$ in. between edge of fingerboard and outside of string, make the seatings for the first and the sixth. There must be no "play" around the strings when fitted, or when played the guitar will produce a most annoying buzz which undoubtedly will give the instrument a bad name. At the nut end, the strings should be slightly higher than a fret above the fingerboard. The other four strings should be fitted so that there is an equal amount of space between all strings, so the *differences in string thickness must be taken into account.*

For the all-wood bridge only ebony, or an equally hard material, will withstand the cutting pressure of steel strings for a reasonable length of time. Should you not have a sufficient thickness of hard stuff to make a solid bridge, you could use the laminated construction shown in Fig. 2A, ebony, etc. to make the bearing surface or saddle, with beech, walnut, maple, etc. glued on each side. The hard saddle will, of course, be in the off-set position as shown.

You may wonder why the bridge-saddle does not lie parallel. This is to compensate for the differences of string thickness and tension. If all the strings were exactly the same length between contact points, there would be a tendency for some to play out of tune.

The saddle of ivory or plastic, etc., is fitted into a shallow groove in the top of the bridge which in this instance can be made of any very close-grained, dense hardwood. Choose, preferably, something which will look nice when smoothed and finished "raw", polished only with a dry rag. No polish or varnish is needed on the bridge.

The height of the bridge, which has a curved top to accord with the nut and finger-board, can be determined by holding in position one of the smooth strings so that it lies about $\frac{3}{16}$ in. above the 12th fret when extended from bridge position to nut. When fitted, the strings will rest in notches cut in the bridge saddle just deep enough to prevent sideways movement. When the bridge is in position the scale length will be set on the first string.

The best way to fashion the bridge is to mark it out on the prepared wood so that a few inches of waste lie below the feet of the component. It is then cut out by fret-saw, and afterwards the waste part is clamped in the vice so that the final shaping and grooving can be done. The adjustable bridge is cut out first of all in one piece, so the parting saw cut must be allowed for in your marking out. The metal fittings may be of plain or plated brass.

Shaping the neck

As the instrument is now nearing completion this is the time to finish the neck to its final shape (Fig. 5, June issue) and it is desirable to first of all make cardboard templates to assist you in this. The total thickness of fingerboard and neck at the nut position should be about $\frac{11}{16}$ in. and at the 9th fret 1 inch. Between these points the neck is perfectly straight and should continue on to the heel in a smooth, graceful curve.

When the neck has been shaped to your satisfaction you can proceed to round off the edges of the body (Fig. 4, July issue).

First assembly

The guitar is now ready for assembly prior to polishing. The first task is to attach the pick-up unit at position A (Fig. 2, June issue) and fix the other components in their respective places. A hole must be drilled under the pick-up position into channel M, to take the lead to the controls. Likewise the jack-plug must be connected. You will need to experiment a little in order to find the correct height for the "poles". In all operations which involve the use of live electrical connections you must follow the instructions of the unit supplier and ensure that there is no danger from improper earthing of the equipment. Accidents have happened where players have touched microphone stands whilst holding guitars with imperfect wiring.

Finishing

When you are satisfied with the performance of the instrument, it should be stripped of all fittings and thoroughly smoothed down with glasspaper. All the surfaces except the fingerboard should be damped (to raise the grain) and smoothed down with flour grade paper until the wood is perfectly smooth.

As we do not have to consider the effects of finishing materials on a sound-chamber, as is the case with acoustic instruments, the solid guitar may be given its final finish by a variety of methods. My choice, both for appearance

and hard-wearing qualities, would be varnish or french polish. Good musical instruments are always finished so that, even to the inexpert eye, they are obviously fashioned from wood. Many of the opaque coverings seen on cheap instruments are used expressly to hide shoddy materials.

If you have chosen nicely-figured woods for the body of the guitar there is no need to alter the colourings, and an appropriate wood-filler can be used in the normal way. Should you decide to stain the body, care must be taken to avoid a patchy appearance on the rim, where the end grain of the softer woods will tend to be darker on account of the greater absorption. In this connection it is best to experiment first of all on some matching waste pieces. After staining, the work must be lightly passed over with flour paper to take off any imperfections caused by the raising of the grain.

A good spirit varnish may be used for the whole of the instrument and is especially preferable, whatever other materials are used, for finishing the neck. This stage of the work is best if done slowly, allowing plenty of time between coats, for the finish to harden. Do the body first by applying the varnish with a 1-inch sable brush and hanging to dry for 24 hours. Then, with the finest grade of garnet paper on a flat cork rubber, glide over the surface to remove any specks of foreign matter, before wiping off with a soft cloth. Repeat the process. In this manner apply four to six coats of varnish and, afterwards, similarly treat the head and neck. To give a final gloss, the varnish is polished with fine pumice and tripoli powder, etc. as described earlier for the fingerplate and control panel. If you prefer, oil varnish may be used for body and head, but in the final polishing, water should be used as a lubricant with the abrasive powders instead of oil. Oil varnish requires much longer to harden than spirit varnish. It will take some weeks to properly finish the instrument by this method. During this time the work must be hung to dry in a warm, dust-free atmosphere.

Another suitable way to finish this sort of instrumen is by the application of french polish over 2 or 3 coats of varnish. The varnish, applied as described above, cuts out the hard work of "fadding" usual in french polishing,

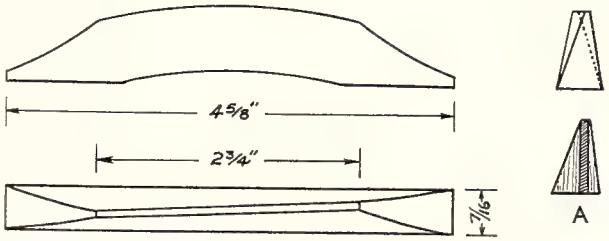


FIG. 2. DIMENSIONS OF ONE PIECE BRIDGE AND SECTION THROUGH LAMINATED BRIDGE A

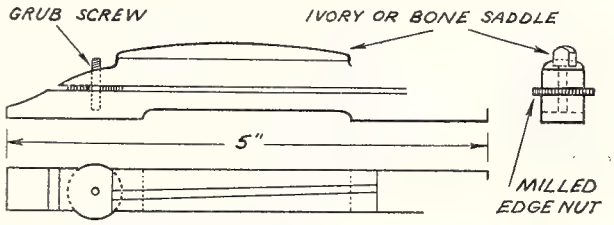


FIG. 3. ADJUSTABLE BRIDGE
The milled edge nut is adjustable on the grub screw.

and is a sound basis for the kind of hard-wearing surface which is desirable on such work. Spirit varnish should be used for this process and when the last coat is hard, the polishing is carried out in the normal way and spirited-off to produce the kind of surface you prefer. Before re-assembling the guitar it should be hung away for two or three weeks for the polish to really harden. (444-560)

CHIPS FROM THE CHISEL

(*Continued from page* 185)

way routine closes in on us, circumstances enmesh us, and who can say that for most men, too, it does not make a charmed circle? It can have very narrow confines, it can be deadly and deadening; only it need not. There can be wings in it, too, the wings of the mind, and men, who are creatures of conscious thought and endeavour, betray themselves if they do not learn to fledge them.

Because the issues are stupendous, they make all the difference between living to full capacity and simply continuing to exist. Living to full capacity means working to full capacity, finding out, if need be by trial and error, where our true abilities lie and working to develop and extend them. The man of his hands works all the better for bringing his mind to it: the first-class craftsman's work is intelligent work in which skill is enhanced and developed by the living interest he brings to it. The best work may become instinctive and intuitive through years of experience: it never becomes dull. Truly creative work never is dull. It calls to some deep thing in us, answers to some need of our nature. Brings new growth, new harmony into our lives.

Nowadays, in spite of all the resources that are becoming so readily available to the ordinary man, life can be very empty. Whatever our material resources, it is still we ourselves who have to make our lives and we can only do this by using our own creative energies. The biggest, best resource is in ourselves. When we are working with all the skill it is in us to give, we are ploughing a furrow that will enfold living seed and bring good work to fruition. We are preparing a harvest for our later years that will have in it the good things we have found by the way, the living interests that have nourished us, the challenges accepted, the defeats surmounted and turned into triumphs. And if these things lead to more good work, leisured good work full of enjoyment, they will round out and complete that maturity of personality which enables a man to stand sturdily on his own feet and lead his own life still.

(421)

CROSSWORD SOLUTION R/62031

(*See page* 197)

ACROSS
1. Carcase.
5. Base.
7. Registration.
8. The Shuttle.
12. Appliances.
16. Trying planes.
19. Deal.
20. Rewired.

DOWN
1. Carnauba.
2. Right.
3. Ass.
4. Earth.
5. Bit.
6. Stool.
9. Hull.
10. Tare.
11. Ebonised.
13. Purse.
14. Auger.
15. Saner.
17. Ill.
18. Low.

Is your October WOODWORKER ordered? If not, please ask your newsagent to reserve it for you straightaway.

The Question Box

These columns are to help readers who are faced with some practical problem. Those wishing to avail themselves of this service should observe the regulations below.

Each query must be accompanied by a stamped addressed envelope.
A coupon from back page of cover must be enclosed.
Full particulars must be stated and, if possible, a rough sketch sent.
Only problems connected with woodwork can be dealt with.
Special designs for individual requirements cannot be prepared.

Queries should be addressed to The Editor, WOODWORKER, Montague House, Russell Square, London, W.C.1.

FINISHING BEECH DOORS

R.S. (Norwich) has purchased a bungalow with flush panelled beech doors. He would like to stain and polish them to a mahogany colour.

Reply: These doors are actually intended for enamelling because beech is a poor staining wood. However, you could polish them to a mahogany shade provided you use a rather strongly-tinted film as follows:

1. It is essential to damp the surfaces and when dry, fine-paper smooth. 2. Begin with a water stain made by dissolving a teaspoonful of bismarck brown to a half-pint of boiling water. When cool, strain off, test on scrap beech and dilute if necessary to give a weak, rather crude, brown/red. Apply quickly and evenly, and allow one day to dry. 3. For the colour coat dissolve well a teaspoonful of bismarck to the gill of meth. (Bismarck dissolves in meths., giving a better red.) Allow to stand sealed for one hour, then pour off gently leaving all dregs. Use this dye with 30% of white polish mixed in. Apply evenly and quickly with a mop, and then give a second coat. Allow 4 hours to dry. 4. For the sealer coats use 80% polish and 20% stain, surplus to the above. Apply 2 thin, even coats. 5. Next day, flat lightly with No. 00 steel wool and remove all dust. You should now start with the rubber using polish tinted slightly with the stain. (162)

TREATMENT OF SAFFRON HEART

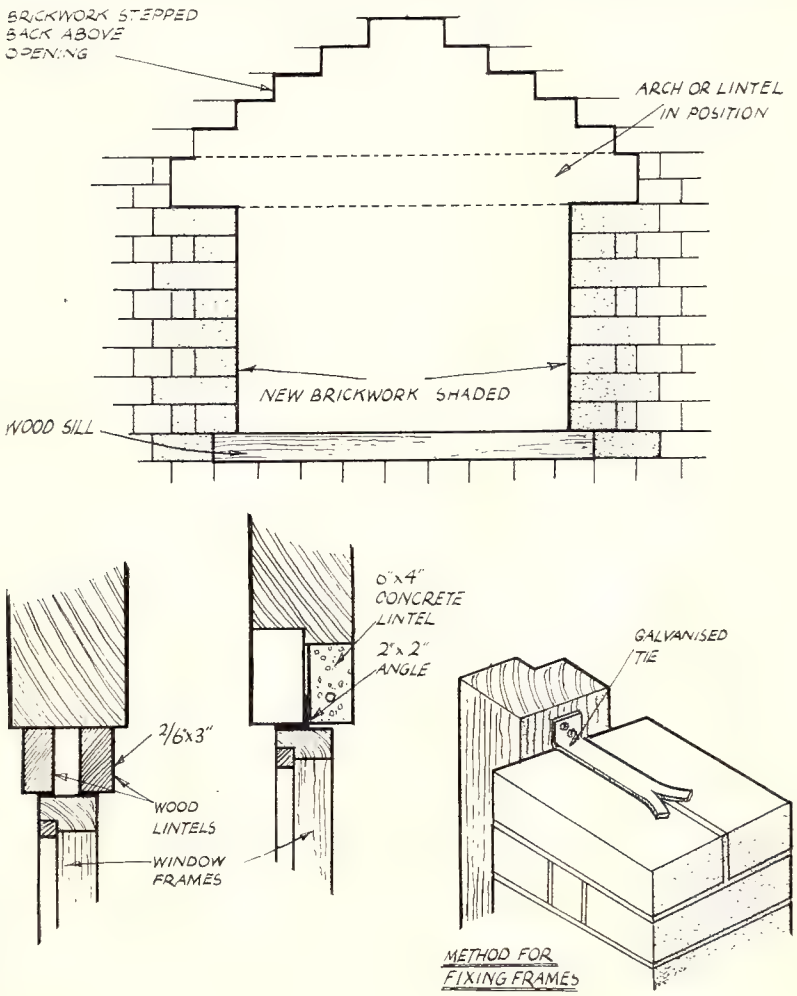
J.F. (Sunderland) asks for information on the wood saffron heart (ghittae wood) of Australian origin which is suitable for the construction of fishing rods. Also the method of tempering this wood by heat treatment.

Reply: The botanical name for this timber is *Halfordia scleroxyla* and *H. drupifera*—family Rutaceae.

Saffron heart does case-harden under heat, though the best results seem to be obtained if green wood is used for the treatment. In this country the treatment would be described as a light charring of the wood. In common with many other timbers saffron heart contains a chemical substance responsible for the case-hardening which is induced by rotating the wood, very slowly and steadily, in a flame.

In Australia and parts of Africa the more primitive tribes make such weapons as spears by pointing, and then charring, the ends of slender branches. The result is exactly the same as with saffron heart, i.e. a general toughening of the wood.

We are afraid this information is all we have been able to obtain that can be regarded as authentic. There is even fairly sharp disagreement about the actual chemical substance responsible for the hardening effect. (427)



MAKING A WINDOW IN AN EXISTING BRICK WALL

A.B. (Wilton) wants to put a window in an existing 9 in. brick wall. The size of the window is to be 3 ft. by 2 ft. and he asks advice on: 1. The size of beam to support the brickwork. 2. How should he proceed in cutting the hole.

Reply: In reply to your enquiry about putting a window into an existing brick wall, in this case a reinforced concrete lintel is much superior to timber. The drawing enclosed shows both methods of construction.

For a window of this size it is not necessary to shore up the brickwork (if the brickwork is sound) after the hole has been cut. The brickwork should be stepped back above the opening as shown in the drawing, and a seating for the lintel(s) provided by means of new brickwork (shown shaded). After the lintel is in position the brickwork above is built in.

The drawing shows a method of fixing the window frames by means of galvanised ties. The framework is, of course, laid in position before the new brickwork and lintel are built in, the ties screwed to the frames and embedded in the brickwork seams.

The concrete lintel and brick soldier arch with 2 in. by 2 in. steel angle is a more costly method of doing this job, but gives a much more satisfactory result. (447)

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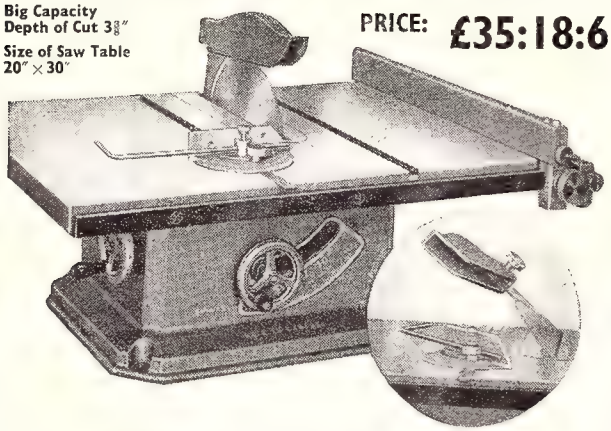

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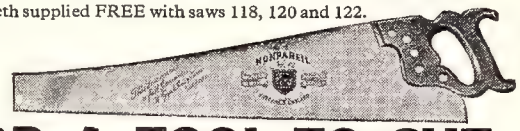

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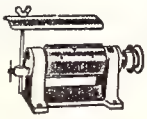

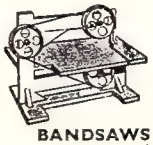

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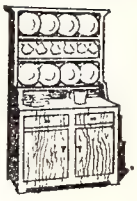

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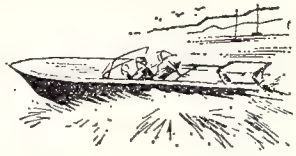

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REPLIES TO READERS' QUERIES

SATURATED PURLINS IN A GARAGE

A.B. (London) has a brick-built garage with a corrugated asbestos roof. In wet weather the purlins to which the roof is attached become saturated. He asks if the dampness can be due to condensation, capillary attraction, or defects in the asbestos. In any case, what measures can he take to overcome the trouble?

Reply: As the purlins become saturated only in wet weather it would seem that the defect is not attributable to the timber itself, and as the word "saturated" has been used, condensation and capillary action almost certainly can be ruled out of consideration.

A possible source of trouble may be in the fixing of the corrugated asbestos sheets. The correct method of fixing is for the fastenings to pass through the tops of the corrugations, and not through the troughs between them.

If the fastenings are driven through the troughs, the rain flows down them, gathers round the heads of the fastenings, and percolates through to the wood. The trouble is accentuated if the holes for the fastenings are on the large side.

Assuming the sheets to have been correctly fixed there may be some slight cracking in them. If so, treatment with a bitumastic paint may cure the trouble.

If it is possible to strip the roof during the summer months, a bitumastic paint can be applied between purlins and asbestos, but time must be allowed for the timber to dry out thoroughly before the paint is applied.

Stripping the roof may seem to be a drastic action, but real saturation of the wood may well lead to the development of dry rot, and the cure of this would be a most expensive process. (428)

SEASONING BLACKTHORN

M.W. (Mohill) finds that when seasoning blackthorn sticks over 1 in. diameter they are prone to crack at the ends. Of course, they do not crack in the length when the bark is left on. Is there a method of seasoning sticks, say in a month or two, which will not crack the ends?

Reply: Here is a problem to which there is no really satisfactory solution.

Blackthorn is a timber that is very prone to end-splitting, and the only one way to prevent this is by very slow drying under controlled conditions. But here the problem is to speed up the drying rate, which is tantamount to increasing the liability of the timber to split.

There is, however, a technique that has been used with varying degrees of success with timbers of a similar nature.

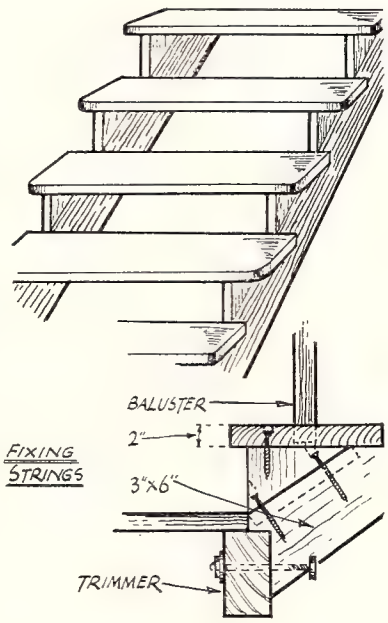
The freshly cut sticks are put in an open box filled with *really dry* sand or sawdust. There must be a good layer of the material between the sticks and the bottom of the box. The latter is then exposed to a mild, constant heat. The theory is that as the sticks dry the moisture is absorbed by the material, which remains just slightly moist around the ends of the sticks and prevents their splitting.

This method cannot be guaranteed to give good results, and a certain amount of experimenting may be necessary to determine how much heat can be used with safety. However, the system is well worth a trial. (973)

CONTEMPORARY OPEN TREAD STAIRCASE

F.L. (Overton) has a contemporary staircase with open treads to make in mahogany. He does not want to use any ironwork to support the treads, the whole thing, except possibly the balusters, to be in wood.

Reply: The answer to this problem depends on conditions 'on the site'. The size of strings depends on the length of flight, but if it is the usual 13-14 steps,



strings of 6 in. by 3 in. with the brackets jointed as shown in the drawing and securely glued and screwed should suffice. The treads should be housed over the brackets to a depth of, say, ⅜ in. and glued, screwed and pelleted. The strings should, if possible, be bird's mouthed over the trimmers top and bottom, but this depends, of course, on the type of floor.

Balusters for this type of staircase are often of metal with a wooden handrail, but if the balusters are of wood they should be tenoned into the treads as shown. The whole staircase should be in hardwood, in this case mahogany. Treads are very often of teak. (448)

ANTIQUE FINISH FOR CHANDELIER

J.K.(Chichester) has constructed a chandelier in beech. To obtain an antique finish he stained it dark oak, with two coats of garnet polish and bees-wax. The result however is unsatisfactory. He asks advice on a suitable method of finishing.

Reply: It would be very difficult to remove the stains already there. Your best plan would be to use wiping or scumble stains on top. These are a refined form of paint containing a proportion of glaze to give a degree of transparency. The colours required are raw umber for the lighter middle areas and sepia or dark brown for the dark areas. A small tube of each in oil (from an art shop) would suit. Thin with turps to stain consistency. It is best to add a few drops of terebene. Brush the umber evenly over the whole job. Allow to dry for a day, then brush on 2 thin sealer coats of polish. Next brush on the dark colour and as soon as the glint goes off wipe out the middle areas, always working towards the ends. Use a rag for this job, damping it slightly in turps if necessary. Follow with a dry brush, working out to get a graduated blending towards the ends of the job. Success depends on how natural this shading looks when the job is complete. You should practise first. You must begin by removing the wax on the surface first with turps or white spirit. Next paper or steel wool lightly to get a matt surface. You should complete the finish with two thin coats of your polish and wax as before. (17)

COLOURLESS POLISH FOR SYCAMORE

J.F. (Kilmarnock) asks advice on the type of polish to use so that the contrast between sycamore and mahogany is maintained without the sycamore turning yellow.

Reply: The white polish usually sold in shops is actually light yellow, and not suitable for white work on which it shows a yellowish cast. What you require is water-clear french polish which you can obtain from: The Jaxa Works, South Grove, Tottenham, London, N.15. It must be stored in a stone or glass container and kept out of sunlight. It is essential to use fresh rubbers, as given a trace of colour in a used one, this can spoil the job.

Sycamore must be finished as soon as the tool finish is completed. It is one of the timbers which darkens with exposure to daylight. The effect is to change to a light golden colour but this will take 3 or 4 years if the finish is applied without undue delay. You could use a lacquer containing an element which filters out the harmful rays—the actinic rays. This is of the cellulose type. Its name is "Lustashine", from Silhouettes and Shapes, 367 Queensbridge Road, London, E.8. (355)

ONE OF THE PANELS FROM A FRANCO—GERMAN COMMODE MADE ABOUT 1785.

The commode is attributed to DAVID ROENTGEN. There are five illustrated panels which illustrate scenes from the "Commedia dell' Arte" designed by JANUARIUS ZICK. The marquetry is of various woods, and the four roundels in the corners are of brass (Victoria and Albert Museum Crown copyright)

MARQUETRY CUTTING

17. Polishing

by W. A. LINCOLN

This article continues with the finishing processes begun last month and concludes the present series on marquetry cutting.

AFTER TWO OR three weeks, the surface presents a dry, patchy appearance, where certain veneers have soaked up all the previously applied polish. Block sand with abrasive paper of finest grade to a level surface and remove all dust. Brush on a liberal flow of polish aiming to get a uniform level of polish.

There are two stages of "cure" with polyurethane lacquers, the first is the "dust-free" stage (after two hours), when the lacquer will not retain dust on the surface, and the second stage, when the polish is completely cured (after 24 hours). This enables successive coats to be applied "wet-backed", as it is known, without waiting for the first coat to be completely dry, when the second coat bonds completely with the first coat, without forming separate layers.

Brush each successive coat in opposite grain direction to attain a thicker build. A good finish is obtained with only two coats, but for a really excellent finish, up to four coats can be brushed—or rather flowed—on.

Allow 24 hours for the final coat to harden off, reaching the second stage of cure, and then scrape the surface lightly with a scraper, holding it flat. Drag it diagonally across the brushmarks. Low spots will show up shinier than the rest. Continue to scrape lightly and these will disappear.

The above method of applying the successive coats of polish in the bodying-up stage apply to polyurethane lacquers; in the case of melamines, polyesters and nitro-cellulose lacquers, it is advisable to allow each coat to dry out thoroughly and then lightly paper the surface before applying the next coat.

The method used by the majority of marquetarians in the bodying-up stage, however, is to use a pad after the first two brush coats.

When the first two coats are dry, allowing a 24-hour interval, rub lightly down with 9/0 garnet paper or equivalent. Then prepare a diluted mix of lacquer and 20% to 25% solvent. In the case of polyester types, the catalysed mix is diluted 25%. Impregnate a small wad of cottonwool with this mix, and twist it until it no longer drips. Use the least amount on the pad which allows it to glide effortlessly, as too much polish will cause ridges in the film, then re-shape the pad and enclose it in a sound rag. Polish the whole surface in a continuously advancing spiral motion along parallel tracks. Work over the picture in this way at least twelve times, gradually increasing the time interval between successive coats, from about a minute or two, after the first two coats, ten minutes after four coats, and half an hour intervals between coats from five or six onwards. This process is a patient one, unhurried, taking as long as is necessary to perfect a build of film.

If any slight ridges, fad marks, hairs or nibs of dust have collected, these will be removed and smoothed away in the next phase.

Rubbing down

Because the protective film of polish is now complete—and is extremely hard—modern methods of abrasion can be applied to the surface either to burnish it to reveal the true brilliance of the polish, or to achieve a perfect egg-shell or satin matt finish.

Using a thick felt pad wrapped around a flat block, as a rubber for "wet and dry" silicon carbide paper, apply a liberal amount of white spirit (turps substitute) to the surface and work in a circular motion across the brushmarks in the polish or scraper marks (if the final fad process described above was not used). Use firm pressure and gradually straighten off with the grain, reducing pressure—keeping the surface wet with white spirit to prevent the paper clogging. Wipe dry and examine for any patches or hollows—which may be papered out using only finger pressure, not the block. This process can be repeated using the finest grade silicon carbide paper and plenty of turps; alternatively, finish off with the finest grade of aluminium oxide electro-coated paper, which does not require lubrication and enables you to see any minute hollows which require attention.

The surface should now be perfectly flat and level, free from all scratches and blemishes. However, the minute fuzziness of the abrasive papering will still mar the perfection of the surface.

Flatting down

Dip a piece of soft cloth or rag in some flatting paste, and apply to the surface, using firm pressure in a circular

motion. Work well into the corners and along the edges, too. As the paste begins to dry out, the cloth will start "pulling"—but continue to rub, straightening out and reducing pressure. This will smooth away all traces of the previous abrasive treatment.

Satin matt finish

The majority opinion among marquetarians is that a matt finish is to be preferred to a high gloss; one can view the picture from different positions without having the beauty ruined by light effects. Also, a high gloss finish is most revealing, and only the very best workmanship dare boast such a finish, as this will surely show up the slightest defect in craftsmanship. For this reason, plus the fact that a matt finish is the easiest to apply, it is the finish universally popular with amateur marquetarians, particularly beginners.

In fact, after the initial phase of sanding sealer and the resting period, the surface could be finished off with superfine wirewool grade 0000 dipped in white siliconised wax polish and applied in straight strokes along the grain. The wax is then lightly burnished off with a soft cloth. However, this easy-matt finish does not provide the work with any of the advantages or protection afforded by the processes already described.

As an alternative to the wax finish, a beautiful satin-sheen matt finish, known in the trade as the "West-End" finish, is made by wetting the surface with turps substitute, and sprinkled liberally with a mixture of pumice and charcoal powders, which is then brushed off vigorously, using a soft-haired shoe brush.

There are many leading marquetarians who adhere to the opposite viewpoint. They feel that a matt finish does not bring out the true lustre and vitality of their work—the picture lacks life and is dull.

They argue that their workmanship is worthy of the best finish possible and will defy minute examination. To overcome objections to light reflection they arrange for the work to be hung in shade.

Burnishing

If a high gloss is required, all previous processes up to the flatting down stage are completed and, after application of the flatting paste, a piece of soft cloth or mutton cloth is dipped in burnishing cream, which is rubbed over the work in circular motions, lightly at first, to distribute the cream evenly to all corners and edges. Then, with firm pressure as the cream dries, in straight lines across the picture, gradually reducing pressure as the gloss appears.

There are proprietary burnishing products, such as "S & S Burnisher" and "Furniglas No. 3" which may be applied some weeks after the polishing has been completed, and will impart an extra gloss.

Metal polishes

One of the latest developments, since the advent of the new "plate-glass hard" polyurethane lacquers, is to brush on four coats (wet-backed with 2-hour intervals) and when dry, eliminating all other processes, work over the surface with proprietary metal polishes such as Duraglit (brass) or Bluebell, Brasso, etc. These may also be used successfully on cellulose lacquers, but make sure sufficient coats have been applied to withstand this type of abrasion.

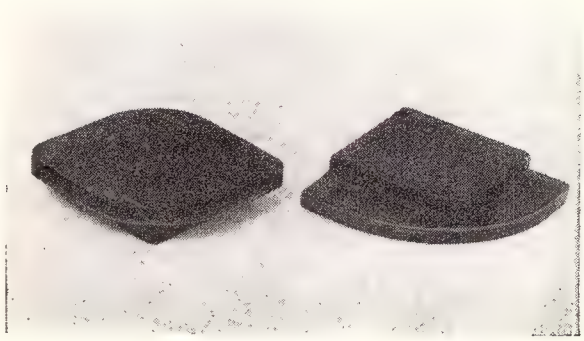
One of the most brilliant high gloss finishes the writer has ever seen was achieved with a lacquer burnished with Duraglit, which removed all brushmarks and brought up a magnificent gloss. (449-429)

CHAMFERING (*Continued from page* 195)

to have a small round-faced wood spokeshave to join up between the drawknife and the plane or metal spokeshave. An excellent tool, just emerging from its wartime obscurity, is the adjustable chamfer shave. The chamfer shave was quite common up to 1939.

Chamfers should never be glasspapered. They should be polished well before assembly, when they are easily got at.

Some variations of the plain chamfer are shown in the drawings. They must be used with restraint, remembering the slogan for decoration on a piece of furniture: "When in doubt, leave it out". (423-180)



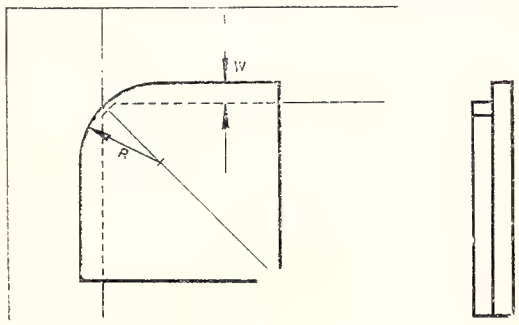


FIG. 5. CHAMFER GAUGES.

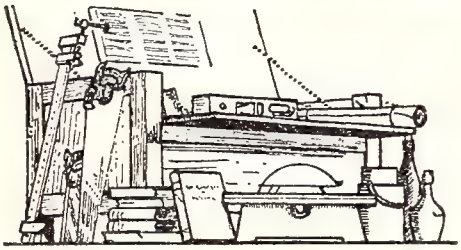
The drawing shows the formula for any size of gauge. R is the radius of the corner, W the width of the chamfer.

SHERATON ON POLISHING CHAIRS

"Chairs are generally polished with a hardish composition of wax rubbed upon a polishing brush, with which the grain of the wood is impregnated with the composition, and afterwards well rubbed off without any dust or bran. The composition I recommend is as follows: take bees-wax and a small quantity of turpentine in a clean earthen pan, and set it over a fire till the wax unites with turpentine, which it will do by constantly stirring about; add to this a little red lead finely ground upon a stone, together with a small portion of fine Oxford ochre, to bring the whole to the colour of brisk mahogany. Lastly, when you take it off the fire, add a little copal varnish to it, and mix it well together, then turn the whole into a basin of water and, while it is yet warm, work it into a ball, with which the brush is to be rubbed as before observed. And observe, with a ball of wax and brush kept for this purpose entirely, furniture in general may be kept in good order."

From Sheraton's Cabinet Dictionary.

THINGS NEW THINGS INTERESTING



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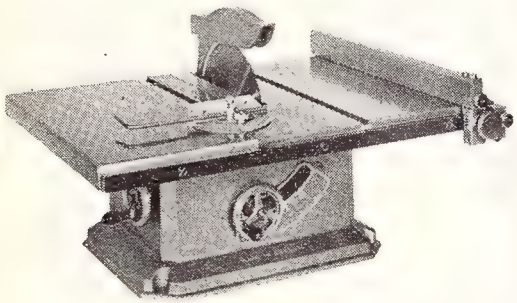

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The saw bench is also available mounted on stand with built-in dust chute with ¾ h.p. motor, three-phase, and press-button starter, cash price £56 17s. 6d. Alternatively motorised 230-250 V. single-phase motor and press-button starter, cash price £59 17s. 6d. Stand can be purchased separately, for use with bench models, £8 5s. 0d.

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Sundial saw benches are made by Parry and Son (Tools) Ltd., 329-333 Old Street, London, E.C.1.

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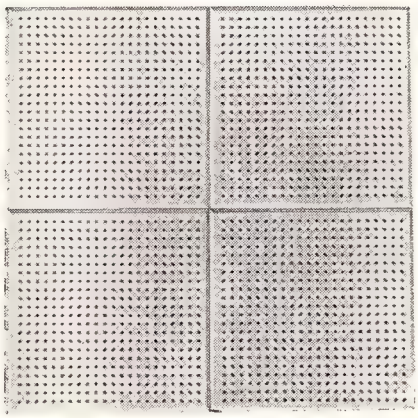

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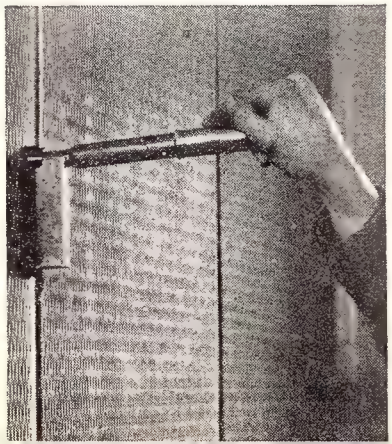
SINGLE HANDED PINNING MACHINE. *This new automatic pinning machine, the LAWCO Model T.J.E.P., has just been introduced. It should prove useful where a lot of relatively thin boards have to be fixed to framing etc. It is eminently suitable for fixing veneers, beading, plywood, building boards, etc., and can pin hardboard up to ¼ in. thick. Special features of the*

THE LAWCO NAIL DRIVER

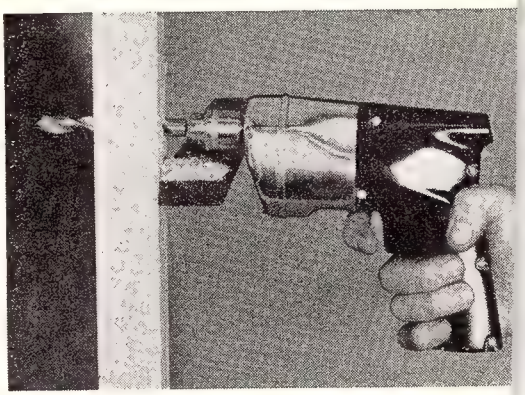


machine are the fact that it does not mark the surface of the board to be fixed and with a simple alteration enables the pins to be countersunk to a variable predetermined depth. The makers, Lawtons of Liverpool, 60 Vauxhall Road, Liverpool, 3, claim that the machine saves some 60 per cent of the time normally taken to drive home pins or nails by the conventional hammer method. The machine uses special pins, ranging in size from ½ in. to 1¼ in., which are loaded as a strip. Selling at £11 10s. 0d. for the machine, pins cost 4s. per 1,000 for ⅜ in., 4s. 4d. per 1,000 for ½ in., 5s. per 1,000 for ¾ in: 6s. per 1,000 for 1 in., and 6s. 6d. per 1,000 for 1¼ in. For bulk orders a discount on the price of pins is allowed.

CORDLESS ELECTRIC DRILL. *Readers may recall that in August, 1961, we announced that the prototype of an electric drill without cable had been demonstrated by Black and Decker. The drill is now in production and we have had the opportunity of testing it. It has a ¼ in. chuck, and will take ¼ in. metal drills up to that size, or stepped drills for wood up to ½ in. It weighs 3 lb. 14 oz., and a safety switch is incorporated which prevents accidental tripping of the switch.*

The chief feature of the drill, however, is that it is cordless, and can thus be used on building sites or at the end of the garden away from any immediate source of electricity, and without a long trailing cable. Its energy is derived from a power pack or cell built within the handle, which needs to be re-energised by being plugged into a source of electricity. It is reckoned that about 75 holes could be bored through ¾ in. wood using a ½ in. drill before re-energising is necessary. In practice what it amounts to is that the drill is plugged in overnight ready for use the next day—in fact it can be left plugged in indefinitely at low charge and is thus always ready for use.

We found the drill quieter in use than the conventional type, and its performance much the



BLACK & DECKER DRILL

same. It is an extremely well-finished tool with plastic handle and Jacobs chuck. Those whose work is away from immediate power should find it invaluable. Thus, assuming that the cell can be re-energised overnight (or every few nights depending upon the amount of work to be done) it could be used aboard a boat, or taken by car for use at a hut or site away from electric power. The power cell can be recharged about 400 times before being expended.

The drill with charger retails at £28. The recharger alone is £4, and replacement power pack £8. It is available through all Black and Decker stockists.

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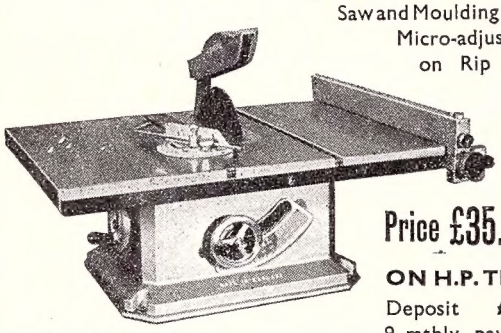

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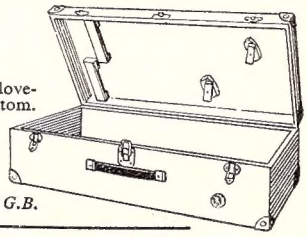

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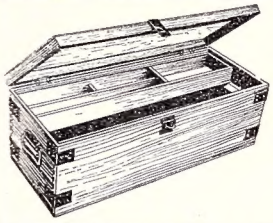

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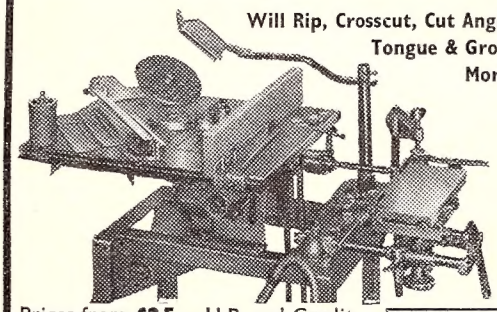

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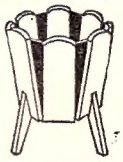

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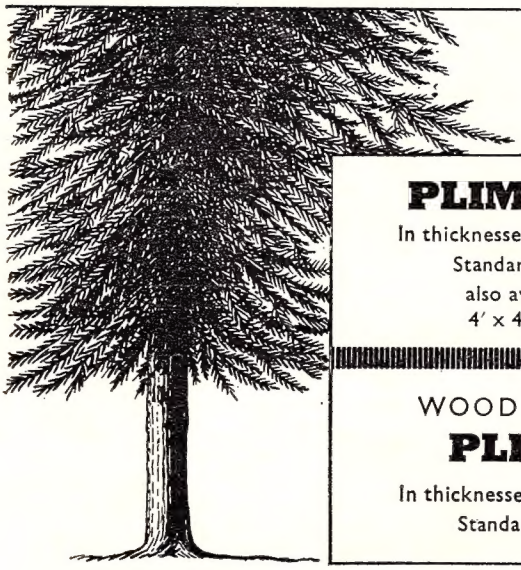

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Published by the Proprietors. EVANS BROTHERS LTD., at Montague House, Russell Sq., London, W.C.1.
Agents for South Africa, Central News Agency Ltd.
Registered for transmission by magazine post to Canada and Newfoundland.
Annual subscription 16s. 6d. post free; U.S.A. $2.25; Canada $2.25.
Printed in Great Britain by Gibbs and Bamforth Ltd., St. Albans, Herts.

"W.W." QUESTION BOX COUPON SEPTEMBER, 1962